The Dock and Harbour Authority

No. 200. Vol. XVII. Edited by BRYSSON CUNNINGHAM, D.Sc., B.E., F.R.S.E., M.Inst.C.E. JUNE, 1937

Editorial

The Coronation.

The Coronation on May 12th of Their Gracious Majesties the King and Queen, was an event of national importance, and though by the date of publication of this issue, it will have receded into a past which, from a journalistic point of view, is sufficiently remote, it seems not inappropriate to write a few lines to express what will undoubtedly be the sincere wish and loyal hope of all our readers, that the reign begun under such favourable auspices of national rejoicing may be long and happy. Indirect though the connection may seem, there is undoubtedly a valid link of mutual interest between the King and our readers, in that his upbringing and service in the Royal Navy will have familiarised him with the physical features of the harbours of this country and abroad, and though he may not have had occasion to concern himself with ports in their commercial aspect, he cannot fail to have noticed during his voyages, the accommodation and equipment provided for the mercantile marine, and the various operations associated with the handling of cargoes. That he will continue to take an interest in the shipping of his country, as the mainstay of its prosperity and welfare, is an obvious deduction, and therewith the development of port facilities will equally be a matter for his thoughtful concern. His Majesty, indeed, gave specific assurance to this effect in his recent reply to the loyal message of congratulation from the Chamber of Shipping of the United Kingdom. British port authorities on their part, as will be evident from the account in this issue of celebrations at various places, have not been behind-hand in demonstrations of affectionate allegiance, and have participated officially, as well as personally, in the national rejoicings. Mariner and shipowner, port official and merchant alike, join in a fervent and heartfelt prayer for the success of the new reign. God Save the King.

A Notable Channel Port.

Calais, the subject of our leading port article and illustrated supplement this month, is peculiarly linked to Great Britain by geographical proximity and historical associations.

Geographically, it is the main gateway for British travellers to the Continent of Europe. The Dover-Calais route is the most familiar, as well as the shortest, across the English Channel, agreeably curtailing the troublesome experience of the latter for those whose stomachs are inclined to be queasy under unstable conditions of equilibrium in a choppy sea. "At Dover and you're over" is the optimistic slogan of the Southern Railway Company's poster, or, as another version of the rhyme puts it, in the reverse direction: "From Calais to Dover, just 20 miles over"—quite a short passage compared with the much greater distances between most of the other ports on opposite sides of the English Channel.

Calais, therefore, is particularly notable as a passenger port, and Anglo-French traffic is the most prominent feature of its activities. At one time within the past decade reaching a peak exceeding 600,000 passengers per annum, the stream of travellers during the past few years, in consequence of the prevailing depression in trade, has shrunk by about one-third and is now in the neighbourhood of 400,000 per annum, approximately the same figure as that immediately after the Great War. But Calais also enjoys a substantial mercantile movement, with imports, including timber of all kinds, notably pit-props, together with ores, manganese, resin, phosphates, nitrates, etc., and exports, chiefly coal to French possessions in North Africa.

The significance of the historical associations of Calais with this country is considerable. It was the last of the English territorial possessions in France, which, at one time in the reign of Henry II., covered fully a moiety of that kingdom, and its loss by capture in 1588 put an end to a vain ambition which had caused numerous wars between the two countries and had cost many lives. The loss of Calais was a sad blow to Queen Mary, daughter of Henry VIII. She died the same year, protesting, so the story goes, that the name Calais would be found imprinted on her heart. Equally romantic, and perhaps no more authentic, is the incident of the surrender of six burgesses of the town to Edward III., with halters round their necks, as victims in place of their fellow-citizens, whose obstinate resistance to his siege had roused the ire of the English monarch. Through the intercession of Queen Philippa, it is said, their lives were spared; but it is hard to believe that a chivalrous and just king, such as Edward is reputed to have been, could have intended to put into execution a sentence so barbarous and cruel. The incident is commemorated in a bronze masterpiece by the sculptor Rodin, now in the Embankment Gardens at Westminster, and it has also been the subject of paintings by eminent artists. In modern times, Calais played an important and hospitable part for the English forces during the Great War, and many will have agreeable recollections of it, en route for the Front, or, more strictly when returning to "Blighty."

Before leaving the subject, it may be permissible to refer to the lofty tower of the Church of Notre Dame, which served as a striking landmark and a serviceable guide to navigation for centuries, a function from the exercise of which, it has been displaced by more modern contrivances. Ruskin has described the venerable pile in a passage of singular charm, and although it has little to do with port affairs, we may perhaps be allowed to quote the following few lines from *Frondes Agrestes*:

"I cannot find words to express the intense pleasure I have always in first finding myself, after some prolonged stay in England, at the foot of the old tower of Calais Church. The large neglect, the noble unsightliness of it; the record of its years written so visibly, yet without sign of weakness or decay; its stern wasteness and gloom, eaten away by the Channel winds, and overgrown with bitter sea grasses; its slates and tiles all shaken and rent, and yet not falling; its desert of brickwork, full of bolts, and holes, and ugly fissures, and yet strong, like a bare brown rock; its carelessness of what anyone thinks or feels about it, putting forth no claim, having no beauty, no desirableness, pride nor grace; yet neither asking for pity; not, as ruins are, useless and piteous, feebly or fondly garrulous of better days; but, useful still, going through its own daily work—as some old fisherman, beaten grey by storm, yet drawing his daily nets: so it stands, with no complaint about its past youth, in blanched and meagre massiveness and serviceableness . . . the grey peak of it seen far across the sea above the waste of surfy sand and hillocked shore. . . ."

But this is a digression, scarcely excusable in a technical journal, and our readers, as prosaic and practical men of affairs, will be more disposed to study the informative article by Monsieur Gonon on page 207. We hasten to commend it to their attention as an up-to-date description of the important activities of a notable French port.

Editorial—continued

Warehousing at Ports.

Though not, perhaps, an essential feature of port operation, the practice of warehousing goods for storage during periods of appreciable duration, as also for the purpose of affording an opportunity for manipulation and treatment of commodities prior to their re-exportation to other markets, is an auxiliary service of considerable importance, both in augmenting the revenues of the port authority and in increasing the attractions of the port for the merchant. Ports, which merely afford the temporary shelter of their waters for the major portion of their imports when these arrive for immediate transhipment or transfer to inland destinations, cannot expect to derive so much financial benefit from the accommodation of shipping, as do those ports which are actual depôts and markets for the incoming goods. Entrepôt ports must, therefore, inevitably possess an advantage over ports of transhipment, and where circumstances admit of it, the creation of a substantial warehousing enterprise, whether in official or even failing that, in private hands, is undoubtedly in the best interests of the port and its activities. A considerable number of ports in this country have built up flourishing businesses of this kind. The article on page 214 by Mr. D. Ross-Johnson, who has had so long and honourable a connection with the Port of Bristol, will be read with attentive interest and we welcome it as a statement of the ripe experience and thoughtful judgment of a distinguished port manager.

Italian Port Development.

Whatever views may be held on the subject of individual liberty and civic freedom (and it is not our province to comment on such matters) there can be no doubt that under a system of rigid rule, in which latitudinarian principles are ruthlessly relegated to the background, Italy has made great strides in material progress. To take one instance of a very striking character, the reclamation of the Pontine Marshes and the conversion of those pestilential swamps into community settlements for agricultural use is unquestionably the outcome of a powerful personal control over national policy, and there are many other directions in which the initiative and untiring enterprise of the Duce have been displayed to the advantage of his country—not least among these has been the development of the Italian ports, at which programmes of improvement have been, and are being, carried on vigorously and without intermission.

Over a considerable period of recent years, Genoa has been particularly remarkable for the expansion of its shipping accommodation and its quayside equipment; and, on the several occasions on which we have visited the port, we have always found energetic measures in hand to anticipate further needs and to keep pace with modern requirements. The magnificent breakwater extending for a length of over three miles along the coastal frontage and the great stretch of sheltered water in the Benito Mussolini Basin and its branches command our unstinted admiration, as also does the imposing new maritime station for passengers on the Ponte dei Mille. We pay our tribute of respectful compliment to Commendatore Ariberto Albertazzi, the Engineering Director of the harbour works on the capable and efficient way in which he has designed and carried out successive schemes for the development of the port. In this number we have the privilege of including an article from his pen on the construction, in a novel and ingenious manner, of the first section of a new large graving dock, ultimately destined to be 1,148-ft. long by 131-ft. wide with 42½-ft. of water over sill, the work on which is in progress. The account of the undertaking on page 221 claims attentive perusal.

While Genoa occupies the leading place in maritime goods traffic in Italy, Naples and Trieste are pre-eminent in passenger traffic, and our readers will recall the descriptive article in our issue of November, 1936, on the impressive new maritime station at the former of these ports. The station, although, we understand, not finally completed, has been in operation since last October. In addition, the port accommodation has been augmented by the construction of three large warehouses, with up-to-date appliances, and a capacity of 40,000 metric tons. Other improvements include the completion of additional quayage at the Pontile G. Bausan and the Pontile Duchessa d'Aosta.

At Trieste similar activities have prevailed. The reconstruction of an important section of the breakwater sheltering the Vittorio Emanuele III. Docks has been carried out and various quay extension and improvement works are in hand. Altogether, there is a spirit of confident enterprise which is actuating Italian port affairs, ensuring an effective national participation in world commerce in the future as in the past. According to the latest information, shipping at Italian ports is steadily increasing and the efficiency of operations is reported from all sides.

Inland Ports.

The completion of the Moscow-Volga Canal, the 80 miles long waterway connecting the central metropolis of Russia with the great river which traverses that country to its southern extremity, thereby giving Moscow access for seagoing vessels up to some 5,000 or 6,000 tons, from the seas both of Southern and Northern Europe, is one more significant instance of the extensive modern development of inland water transport. The commercial world has long been familiar with the importance of Paris and Brussels as inland ports dealing with water-borne commerce of considerable dimensions, and many other towns and cities in Central and Western Europe are linked in busy traffic with the outer seas by means of river and canals. Moscow, however, has hitherto been remote and relatively inaccessible, at any rate, to any but quite small craft. Situated on a shallow river, in which navigation is rendered difficult by shoals and sandbanks and by insufficiency of water during the summer season, it required no little enterprise and vision to embark on the undertaking which has now removed these disabilities and made Moscow a "sea port." The new canal is considerably longer than the North Sea and Baltic Canal, which is 61½ miles in length, and the ship canal to Manchester, the length of which is 36 miles; the volume of excavation has been correspondingly greater, though less than that involved in the construction of the Panama Canal, which has about 50 miles of navigable waterway. On the other hand, the Suez Canal (100 miles) is appreciably longer and, of course, much larger. Commenced in 1932, the construction of the new Russian Canal has involved difficulties of no mean order by reason of the elevation of the ground, which, beginning in the vicinity of the Volga, continues for a distance of 25 miles along the course of the canal. The existence of this high ground rendered a lockless canal impracticable and involved the introduction of a system of ten locks and other hydro-technical structures to overcome a rise of more than 130-ft.

An important, though subsidiary, feature of the undertaking is that, with the aid of reservoirs formed along the canal by means of dams at the intersection points of rivers, it will serve to supplement, to a considerable degree, the potable water resources of the city, increasing the available supply, it is said, from 29 to over 130 gallons per capita daily. That Russian household requirements will reach so high a figure is open to doubt, but the reserve at disposal is certainly impressive to English, though perhaps not to American consumers, who, in certain of their cities, are accustomed to supplies ranging considerably above 100 gallons per capita per day and even reaching 200 gallons. The Khimki Reservoir, with an area of 3½ square kilometeres, forms a large harbour at Moscow River Station.

Following on the realisation of the great Dnieprostroi project of hydro-electric power development, the accomplishment of the construction of the Moscow-Volga Canal is a notable and tangible proof of the energetic administration of the Soviet régime and of the determination of the authorities to secure a leading place for Russia in the commercial and industrial sphere.

Canadian Free Ports.

The Senate Banking and Commerce Committee in Ottawa has approved a Bill authorising the creation of "free ports" in Canada.

The Bill provides that any province, municipality or agency may, at its own expense and after obtaining the approval of the Department of Transport, establish free zones or free ports, to which goods from abroad may be consigned duty free for trans-shipment. Customs duties would be paid only if the goods were released from the free ports for use or consumption in Canada.

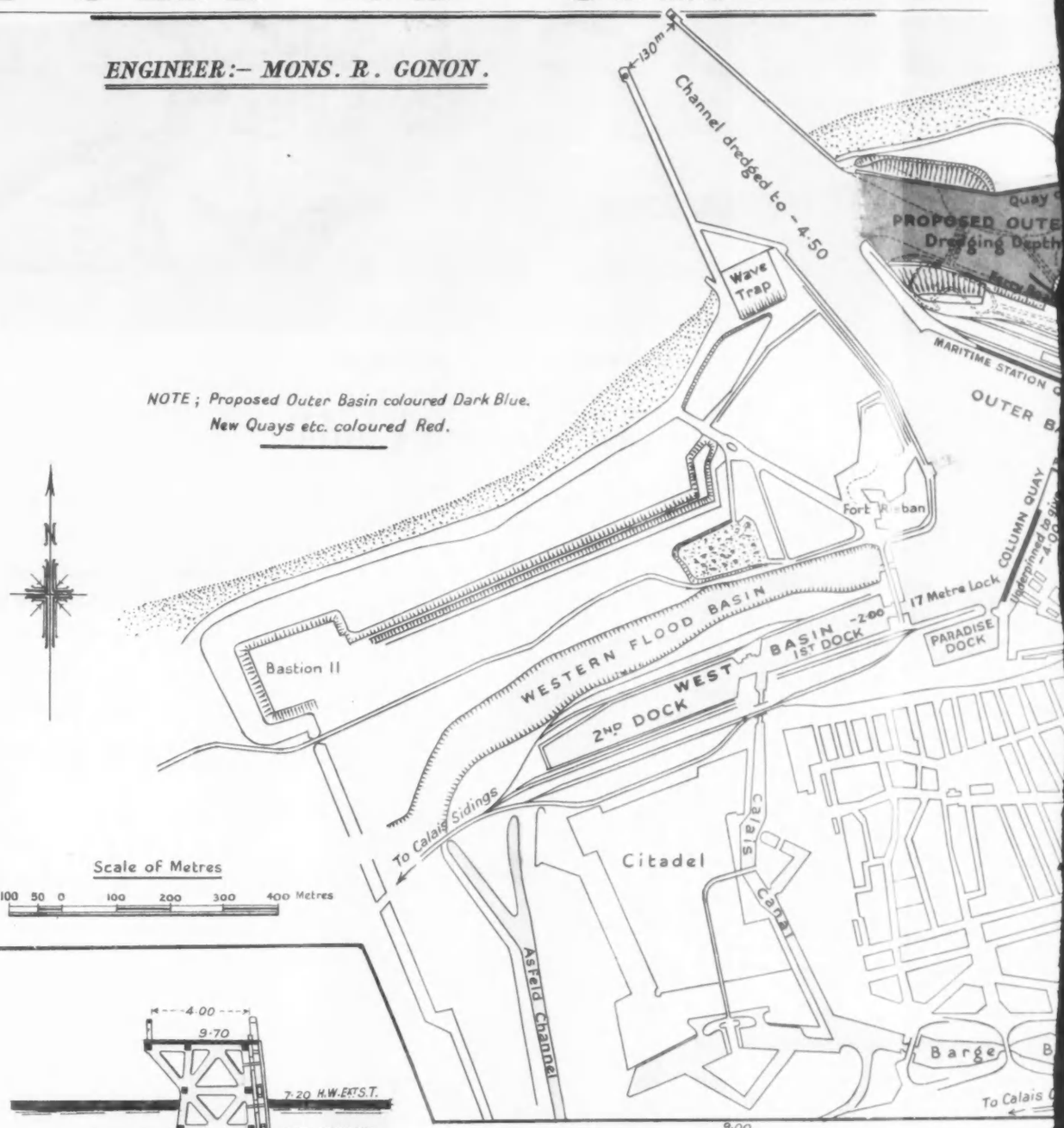
The Canadian Manufacturers' Association, the Canadian Chamber of Commerce and the Boards of Trade of Montreal, Toronto and Vancouver have submitted briefs objecting to the measure. The C. M. A. argued that the present bonding arrangement was satisfactory and that the introduction of free ports would tend to duplication of existing facilities.

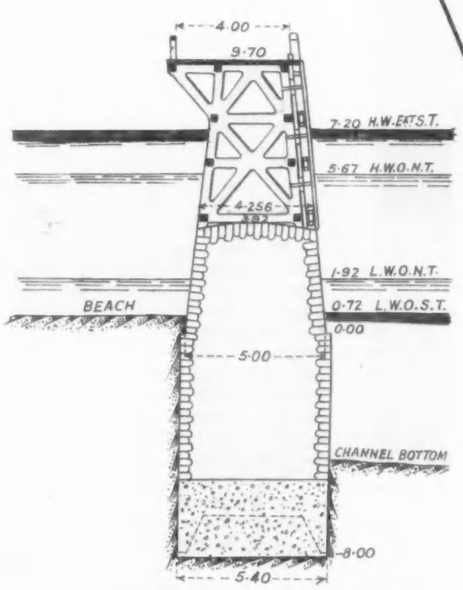
It was claimed that Canadian conditions were fundamentally different from those which prevail in several European countries for the successful operation of free ports. Systems of drawbacks in Canadian customs regulations adequately encourage exports and re-exports, the C. M. A. said, and urged that a thorough technical investigation was essential before any free ports measure was approved.

The Canadian Chamber of Commerce said that there had been no change in the declared opposition of organised business to the measure, and the three Boards of Trade added their protest to that of the two other associations. The Vancouver Board of Trade said there was no public demand from organised business for such legislation.

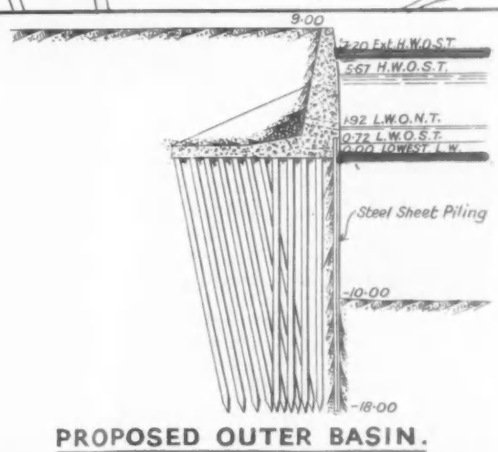
PORT OF CALAIS.

ENGINEER:— MONS. R. GONON.





WEST JETTY



PROPOSED OUTER BASIN.

SCHEME FOR QUAY OF SHEET PILING & REINFORCED CONCRETE

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DOCK AND HARBOUR AUTHORITY, JUNE, 1937

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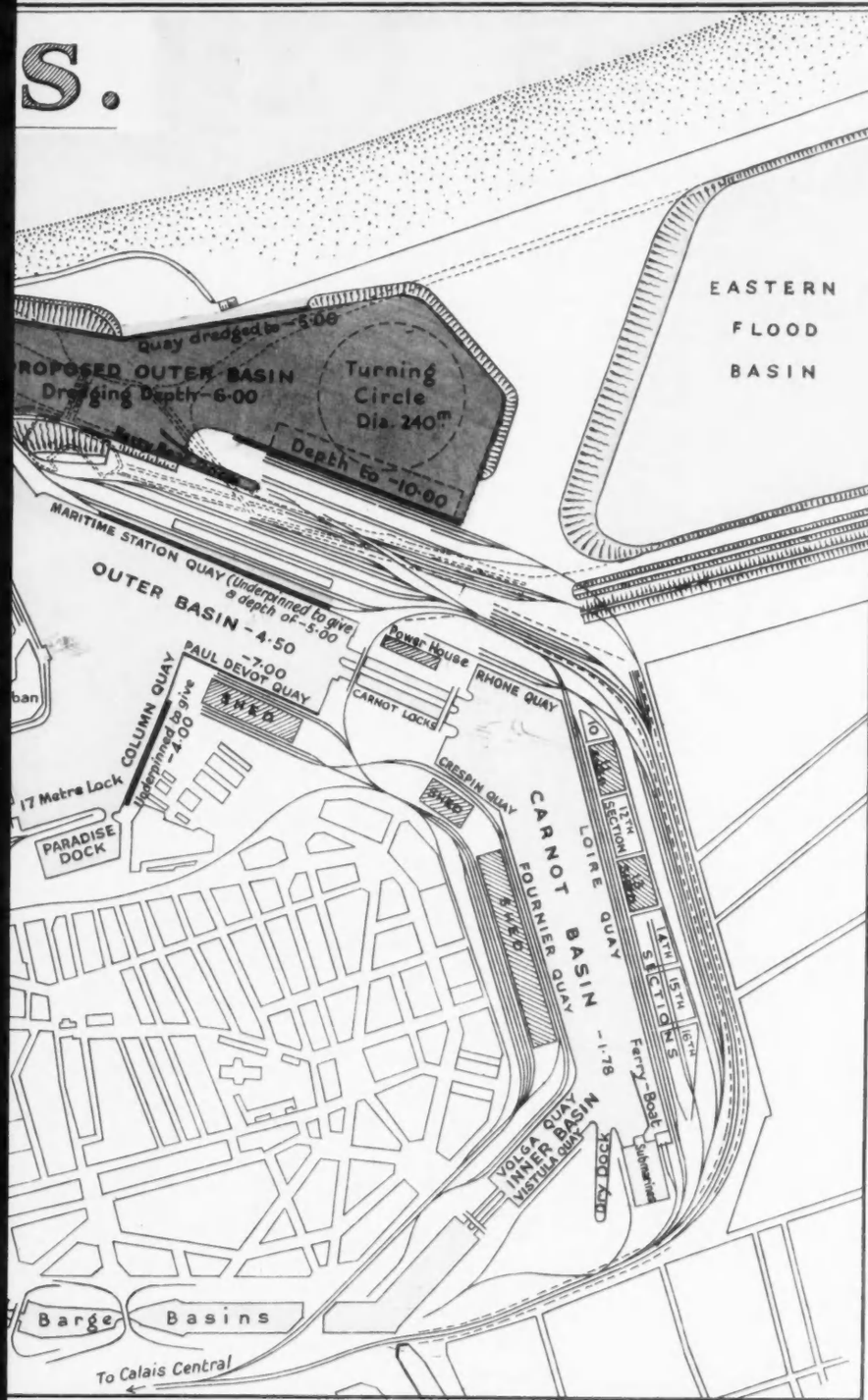
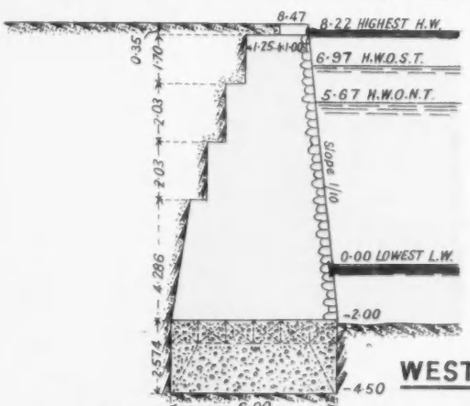
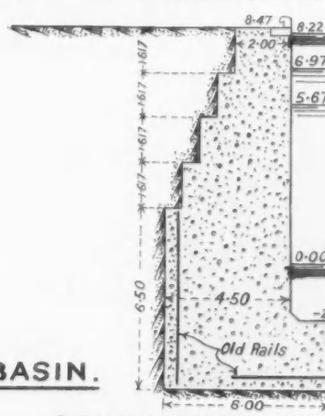




WEST BASIN.

SOUTH QUAY — 1ST DOCK
COMPRESSED AIR CAISSONS.



SOUTH QUAY — 2ND
SOLID WALL BUILT IN T

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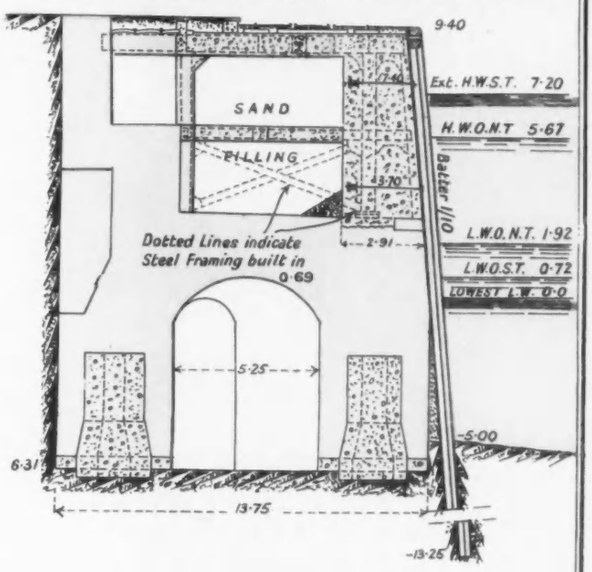
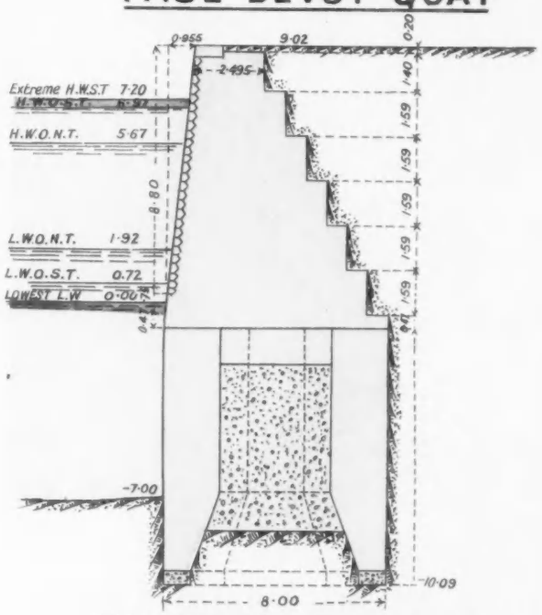
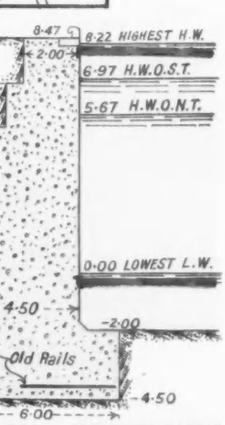
UNDERPINNING — SECTION



PAUL DEVOT QUAY

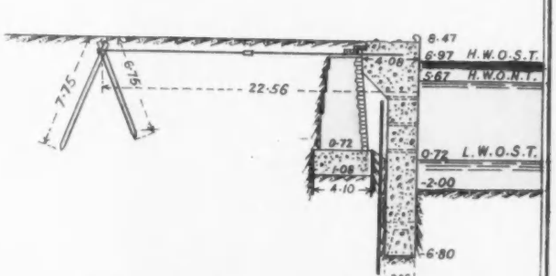


ON MONOLITH WELLS.



AY — 2ND DOCK.

BUILT IN THE DRY.



WEST BASIN — 2ND DOCK.

UNDERPINNING SOUTH QUAY.

QUAY WALL ON CAISSONS WITH ANCHORAGE

The Port of Calais in the Seventeenth Century.

The Port of Calais

*By M. GONON, Ingenieur des Ponts et Chaussees**

I—Historical

a. The Economic Role of the Port.

THE earliest mention of Calais appears in historical records about the end of the tenth century. From the beginning, the history of the town is that of the military and commercial relations between France and Great Britain. The first notable event to bring the activity of the port into prominence was the sailing in 1066 of a fleet of 60 vessels, under the command of Baldwin VI., Count of Flanders, to support the ill-fated pretensions of Tostig, claimant to the throne of England. In the following century, it was at Calais that Richard, Cœur de Lion, landed on his way to the Crusades.

Documents of that time reveal the existence of a regular transport service to England from Calais, as early as 1285; an association of owners of "ferry-ships" maintained regular sailings at fixed fares for conveyance of travellers and their horses. While participating in the development of peaceful intercourse between the neighbouring nations, Calais at the same time took part in hostilities between them. In the 14th Century, ships of Calais engaged in privateering in the Straits, and the Burghers of Calais had but a narrow escape from the harsh treatment threatened by the resentment of Edward III. after the fall of the town, in 1347.

Monsieur R. GONON,
Ingenieur des Ponts et Chaussees

The two centuries of English domination were for Calais a period of exceptional prosperity; Edward III., immediately after his conquest, established there a general storage centre for all English goods, known as the "wool staple," which soon became famous throughout Europe. Calais merchants became bankers to the Kings of England, in whose dominions their city constituted a most powerful state. It was at Calais that Henry VIII. landed, with his magnificent retinue for his meeting with Francis I., on the "Field of the Cloth of Gold," at a distance of only a few miles from the town. A few years after its recapture by the Duke of Guise, it was again at Calais that Mary, Queen of Scots, bade her last farewell to the soil of France.

The commercial fortune of the port sustained various vicissitudes during the centuries that followed, when there were only rare intervals of peace between the nations. Its prosperity suffered a check in the 17th Century; but the regular cross-Channel passenger services between Calais and Dover continued to operate, by means of sturdy little coasters, in such conditions of safety that in 1792 the news of the day could mention an accident that had happened on the 28th January of that year as being the first that there had been to deplore for 105 years.

After a brilliant period in the 18th Century, there was another depression during the wars of the Revolution and of the Empire, succeeded by a definite return of prosperity, which began with the landing of Louis XVIII. at the Quay of the Column, on the 24th April, 1814. The factors of technical progress of the 19th Century, as fast as they emerged were put to practical application in the equipment of the Calais-Dover line; the first regular service employing steamboats was established in 1820, with the steamer "Rob Roy," of a length of 24 m 70 (79-ft.) and 90 tons register. The first French maritime railway station was opened at Calais, in 1849. Also the import of timber from the Baltic and of heavy bulk goods—coal, ore, etc.—assumed an important place in the trade of the port.

This brief review may be concluded by recalling the leading part played by Calais, from 1914 to 1918, as an Anglo-Belgian military base. It may also be recorded that the Great War furnished occasion for adapting to the Anglo-French traffic, via Calais, of train-ferry boats such as had previously been used only in tideless seas.

b. Development of the Port Lay-out

At the time of Julius Cæsar's invasion, the region lying between the North Sea, the Aa River, and the Boulogne Hills, was still submerged; certain historians locate here the "Sinus Itius" where the Roman fleet of 800 sail assembled before setting out for its conquest of Britain. This shallow gulf was gradually filled up by the accretions which formed to the eastward from Cape Blanc Nez; moreover, the action of Nature was assisted by that of men seeking to reclaim lands from the sea for cultivation.

A lagoon stretching from East to West behind a coastal line of sand dunes remained in the 7th Century as the only vestige of the original gulf. It was on the shores of the main channel which connected this natural basin with the sea that the Port of Calais was founded. From the 10th to the 14th Centuries the endeavours of engineers seeking to improve conditions were directed to the following two objectives:—

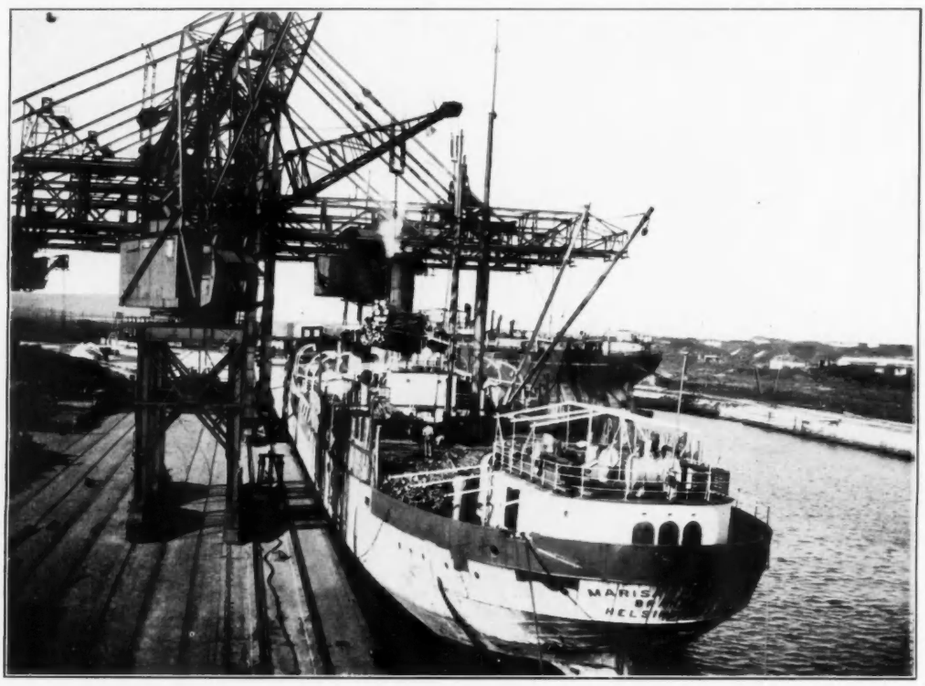
1.—To increase the intensity of the ebb tide in the channel through the fine sand which forms, to a thickness of about 20m., the shore to the eastward of Cape Blanc Nez;

*Based, by permission, on an article in *Science et Industrie*.

Port of Calais—continued

2.—To preserve this channel against the encroachment of sand, carried from East to West by tidal drift, and to protect it from the swell raised by winds in the sector N.W. to N.E., to which this part of the coast is directly exposed.

To meet these two conditions, the engineers had recourse to the classic methods of improvement of harbours on a sandy shore;—(1) Confining the channel between two jetties, the general alignment of which to N.N.W. results from a compromise between the object of arresting the deposit of sand and that of protecting the harbour from the winds of the northern sector;—(2) Creating a reservoir of tidal water, by closing what remained of the original lagoon by means of a bank with a locked opening or sluice, so as to replace the natural ebb flow by a stronger artificial flushing effect.



Six-ton Transporter Cranes in the West Basin.

It was only during the second half of last century that, consequent upon the introduction of dredging machinery, it became possible to abandon these time-honoured methods of harbour improvement; the internal channel and the external passage have since then been maintained by dredging.

The principal stages in the development of the port may be summarised as follows:—

(1) In 1533, Henry VIII. had a project drawn up, comprising the construction of two jetties about 200 m. long, leaving between them a channel 200 m. wide; the formation of a grounding basin (of which the still existing Paradise Dock is a visible remainder) and the construction of a locked barrage with three sluices, in front of the Citadel.

Of this project, only the first two items appear to have been carried out. The harbour, as left by Henry VIII., served without much modification until the end of the 17th Century; except that the jetties were rebuilt, their direction inclined farther to the West and their distance apart reduced from 200 m. to 125 m. In 1684, the bottom of the channel and of the grounding basin connected with it was at the level of + 1.12, giving a depth of 5.85 metres at spring tides.

(2) The second general project was that planned in 1673 by Vauban. That eminent engineer proposed the lengthening of the jetties and the creation of a flushing basin closed by sluice gates. The first part only of this work was carried into effect, between 1701 and 1784. The length of the new jetties was 650 m. for the Western and 500 m. for the Eastern arm, this difference being apparently due to the desire to keep sand out of the channel. Their relative position was slightly divergent, the width between them increasing from 80 m. at the root to 110 m. at their outer ends.

This alteration achieved an increase in depth of 60 centimetres (2-ft.), instead of the 2 m. (6½-ft.) expected by Vauban. But by 1749, the beach having advanced seaward by 250 m. the whole advantage of this jetty extension was lost.

(3) It was not until 1829 that a further programme of expansion was brought forward. A project of Raffeneau de Lisle received authorisation by laws of 15th November, 1834, and 9th August, 1839. This comprised the lengthening of the jetties by 240 m., the formation of a wet dock or basin dredged to + 0.72 m., closed by a simple lock 17 m. wide, and the embanking of the "Dunes" lagoon by dykes to convert it into an artificial flushing basin. This programme was carried out in its entirety. The fresh extension of the jetties had no more success than earlier extensions; it effected at first a deepening of half-a-metre, but the low water line advanced once more by more than 150 m. On the other hand the scour of the flushing water—the volume of discharge of which attained 350 cubic metres per second during the first half-hour on spring tides—reduced the bottom to about—4.78 in the channel as a whole and—1.50 at the tidal quay formed for berthing the Calais-Dover steamers in that section of the channel where the scour of the sluicing was most effective. It may be observed in passing that such cross-Channel steamers in 1865 drew from 2 m. to 2¼ m. and that the service could not be run to an exact time table.

(4) We come next to the important programme of works contemplated in the "Freycinet" plan, which completely alters the features of the port and town of Calais.

This programme, declared to be of "public utility" by laws of 14th December, 1875, 28th July, 1879, and 3rd August, 1881, comprised essentially:—

The opening of an outer basin dredged to—3.50 and flanked on either side by tidal quays, behind one of which a new maritime station was situated.

The excavation of a wet dock of 12 hectares (30 acres) closed by two locks, dredged to—1.78 surrounded by 1,260 metres (¾ mile) of quays and communicating with a line of basins for the accommodation of boats and other small craft.

The reconstruction of the East Jetty, with a view to enabling the Channel to be sunk to—4 m. and eventually to —5 m.; the jetties being set out to a slightly tapering alignment in plan and the distance between pier heads increased from 95 to 130 m.

The formation of a new flushing basin with sluices, by encroaching on the former beach, within the shelter of an embankment built up with the material excavated from the Carnot basin.

These new works were brought into use on 3rd June, 1889, before completion of the reconstructed East Jetty, which in fact was only finished in 1894. The Eastern flushing basin, moreover, was never utilised, the maintenance of depth having been effected since 1880 by dredging alone.

(5) The last extensive works effected at Calais were undertaken under the powers of a decree of 7th April, 1898, and laws of 24th February, 1906, and 30th June, 1911. They consisted in:—

(I.) The enlargement of the old wet dock designed by Raffeneau de Lisle by inclusion of part of the old grounding dock, necessitating the construction of a new lock, whose sill is at the level of—2 m. This work was done between 1901 and 1904.

(II.) The abolition of the lower portion of the old Western flushing basin with its lock

(III.) The under-pinning or reconstruction of the South quays of the Western Basin, so as to lower the bottom to—2 m. These works, retarded by the War, were carried out in two stages, from 1911 to 1916 and from 1928 to 1934.

(IV.) The reconstruction of the Western Jetty, without increase in its length but with a considerable increase in the angle of convergence (from 8° 40′ to 23° 20′) with the object of reducing wave effect in the harbour:—1913—1928.

II—Administrative Organisation of the Port

The Port of Calais is administered under the system prescribed by the decree of 8th April, 1924, for non-self-governing ports. New works are carried out with the aid of a large contribution to their cost from the fund derived from

Port of Calais

The Maritime Station.

Ferry-boat Berth in the Carnot Dock.

Port of Calais—continued

dues and charges levied by the Chamber of Commerce. Works of maintenance are paid for by the State.

The use of port equipment (sheds, handling machinery, graving dock, etc.), and the service of tugs, are controlled by the Chamber of Commerce.

III—Present State of the Port

a. General Description.

The Port of Calais is located at the entrance to the North Sea from the English Channel, 11¼ miles North-East of Cape Gris Nez and 21 miles South-West of Dover. Its geographical situation renders it the most natural point of transit for passengers and goods demanding rapid transport, because the Calais-Dover route is the shortest of all those followed by cross-Channel traffic between England and the Continent.

The prevailing winds in the region of Calais are those from the West and the strongest winds are those from the North and North-East. The range of tide varies from 7 m. 20 at springs to 3 m. 50 at neap tides. The tidal currents run in a direction parallel with the coast; the flood tide running East and attaining a maximum of 3½ knots. The entry of vessels to the port is timed as far as possible at 2½ hours before high water, taking advantage of the reversal of the current.

b. Approaches.

a. Roadstead.

To seaward of Calais at about ⅜ mile out from low water mark, there is a bank lying nearly parallel with the shore, to which it is joined by a belt of shallows Eastward of the port. This bank, the ridge of which is at a level of about—3 m., has a very steep slope on its landward side; the bank and the shore form the two sides of a depression having a width, opposite the nearest point of the bank, of about 1,100 m., and a depth of from 10 m. to 15 m. at low water. This deep water offers to ships at anchor a measure of shelter from the winds in the sector from West to North. The point of the bank is marked by two lighted buoys.

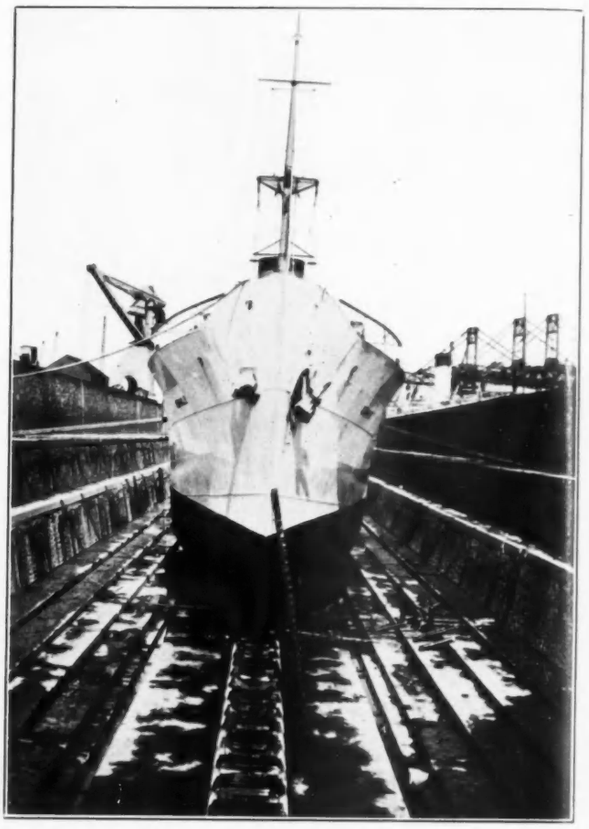
b. Channel and Outer Basin.

The bottom of the outer channel is maintained at—6 m. by suction dredgers. On either side of it, to East and West, two pits or traps have been sunk, to intercept any sand disturbed by storms.

Four 6-ton Transporters on the Loire Quay.

The inner channel is confined between two converging jetties, each consisting of a solid vertical faced mole with framed timber super-structure, the lengths being 414 m. for the East and 330 m. for the West Jetty. The pierheads are set approximately at low water line of spring tides and 130 m. apart. Between the root of the West Jetty and the Channel proper lies a wave-trap with a spending beach, at a slope of only 8 per cent. or 1-in-12; this arrangement, which was made when the jetty was recently reconstructed, has proved very effective in damping the swell within the harbour.

The Channel and the Eastern outer basin are dredged to —5 m.; the width of bottom at this level varies from 100 m. between the jetties to 70 m. in the narrower part alongside the tidal quay. In the Western outer basin, the Channel leading to the entrance lock, only, is dredged to—2 m.



Graving Dock.

c. Dredging Data.

The dredging operations (dealing with fine sand in the outer Channel and the beginning of the inner Channel and with mud everywhere else) are carried out by means of the plant listed hereunder:—

	Length	Beam	Loaded Draft	Propelling Engines	Dredging Engine	Speed	Capacity per Hour	Hopper Capacity
Bucket Dredger ...	M.	M.	M.	H.P.	H.P.	M.	M³.	M³.
"Les Ridens" ...	48	9·75	3·60	2 × 500	200	7	275	201
Hoppers, "Courgain" and "Risban" ...	40	9	3·60	400	200	7	275	320
Suction Dredger "Boulogne III" ...	48	9	3.60	306	303	6	300	337

The dredger "Les Ridens," built in 1929, is fitted with a ladder of a length of 27 m. 30, enabling it to work at a depth of 12 m. 50. The bucket chain carries 36 buckets of 320-litre (⅓ cubic yard) capacity. The two hoppers, brought into service in 1931, are driven by Diesel engines of Sulzer type. The charging time is about 1 hr. 10 mins. each; the distance from working position to dumping area is 2 to 3 miles, so that the double journey of a hopper takes about an hour.

The table below compares the volumes dredged in 1900-1901 (the channel to—4 m. and the outer basin to—3 m. 50) and in 1931-1935 (the channel and outer basin both to—4 m.):

	Outer Channel	Inner Channel	Outer Basin	Total	
	Suction	Buckets/Suction	Buckets	Buckets	Suction
1900-1901 (Average)	117,481	33,922 + 71,458 = 105,380	85,906	119,828	188,939
1931-1935... (Average)	123,768	138,121 + 18,284 = 156,405	128,910	267,031	142,052

Port of Calais—continued

c. Equipment of the Port.

a. General Notes.

The port consists of:—

(1) The Eastern outer basin, surrounded by tidal quays;

(2) The Western outer basin, with its annexe the Little Paradise Dock, which serves as a grounding dock;

(3) The Carnot Basin, of an area of 12 hectares (30 acres), giving access to shipping by two locks, respectively 21 m. and 14 m. wide, 133 m. 50 and 137 m. 45 in effective length and having their sills at—1.78 m.;

(4) The Western basin, of 4½ hectares (11 acres) in area, closed by a simple lock 17 m. wide, whose sill is at—2 m.

The following table gives in summarised form information regarding the various quays, their physical characteristics, their crane equipment and their customary use:—

Designation of Quay	Length M.	Dredged Depth	Depth of Water Alongside H.W.O.S.T.	Depth of Water Alongside H.W.O.N.T.	Sheds M.	No. of Sidings	Cranes t.	Normal Use
1.—Outer Basin and Grounding Basin.								
Tidal	192	—5·00	5·72	6·92	—	1	—	No Commercial use.
Maritime Station	558	—4·50	5·22	6·42	Station (Passengers and Mail)		3 × 5/7	Anglo-French traffic.
Paul Devot	244	—7·00	7·72	8·92	160 × 40	5	2 × 10 2 × 5 2 × 1·5	Cargo Boats, Motor Car Carriers, Lightening.
Column (South)	718	+1·75	—	—	—	—	—	Grounding Berths for Fishing Boats.
Angoulême & Paradise ...		+1·92						
Column (North)	67	—4·00	4·72	5·92	—	—	—	Barges, Excursion Boats.
2.—Wet Docks.								
Carnot Basin — Crespin	135	—1·78	8·75	7·45	80 × 40	5	4 × 2 6 × 3	Sawn Timber, General Cargo.
Carnot Basin — Fournier	423	—1·78	8·75	7·45	320 × 40	6	1 × 1·5	Sawn Timber, General Cargo.
Carnot Basin — Rhone	144	—1·78	8·75	7·45	—	3	4 × 6	Pit Props, Paper-making Logs, Coal, Ore, etc.
Carnot Basin — Loire	657	—1·78	8·75	7·45	2 each 85 × 40	6	3 × 6 5 × 6 9 × 3	Pit Props, Paper-making Logs, Coal, Ore, etc.
Inner Basin — Vistule and Volga	375	+0·72	6·25	4·95	—	1 & 4	1 × 30 4 × 1·5	Sawn Timber, Straw.
West Basin — 1st Dock South ...	240	—2·00	8·97	7·67	—	5	5 × 3 3 × 6	Pit Props, Paper-making Logs, Coal, Ore, etc.
West Basin — 2nd Dock South ...	373	—2·00	8·97	7·67	—	7	2 × 0 5 × 6	
West Basin — 1st Dock North ...	242	+1·92	5·05	3·75	—	1	3 × 2	Empty Boats.
West Basin — 2nd Dock North ...	244	+0·72	6·25	4·95	—	3	2 × 1·5	Pit Props, Logs, Cement, Iron, Petroleum.
West Basin — Wharf	70	—2·00	8·97	7·67	—	—	—	

The total length of mooring quays thus amounts to 1,582 m. (nearly 3 miles), allocated as follows:—

Passenger traffic (ordinary and excursion), express goods, motor cars from or for England, 869 m.; small fishing craft (quays of the grounding dock), 718 m. goods traffic, 2,595 m. (of which, 1952 m. are accessible to ships drawing over 7 m. or 23-ft.).

The total area of sheds (single storey) is 36,000 sq. metres. That of areas available for the dumping of cargo (after deduction for railways, roads, etc.), is 153,000 sq. metres.

b. Technical Description of Port Works.

The whole of the works in the Port of Calais are founded on sand. It is necessary to go down at least 20 m. below zero datum of marine charts to reach the stratum of Flanders clay and to 100 or 150 m. to find the chalk.

The sand is a very fine dune sand which, notwithstanding its permeability, offers considerable resistance to the passage of water (a bank of sand 8 m. wide at top and 27 m. at base can retain water to a head of 10 m.) and, though liable to run like a fluid when anything occurs to set it in motion, it can nevertheless stand with an almost vertical face, even when damp. The base which it forms has the virtue of ability to carry heavy loading without appreciable settlement. It has the disadvantage of being affected by the least movement of water, and under the influence of water to seep through every crevice in a quay wall.

The earliest works constructed consisted either of timber framing on piles, with the soil revetted by fascine mattresses to prevent scour, or else of timber cribwork filled with rubble exercising little lateral pressure. No trace now remains of any of the works constructed in this style.

The first solid quay walls were built by tide-work upon timber platforms supported on piles. Later, the engineers employed almost exclusively a foundation bed of mass concrete, laid under a shallow depth of water between parallel lines of sheet-piling, within an area excavated in bulk after dewatering behind temporary dams or dykes of sand. The locks and the quays of the Carnot Basin were also constructed by this method. The concrete employed at that time was a concrete made with hydraulic lime with the addition of artificial Puozzolana. It appears now, after 50 years, to be completely decomposed.

From the year 1880 and for the works in the Freycinet programme, the engineers have made extensive use of the process of sinking piles and sheeting by water jet; also of the type of foundation which consists in masonry monoliths or wells sunk by excavation, with hydraulic extraction of the spoil. This latter process was applied to the greater part of the quays of the Outer Basin, the size of the sea walls reaching 8 m. square. It has the drawback of requiring a great number of joints—which were made with concrete deposited under water, between two shutters of sheet steel, after hydraulic excavation of the space between two monoliths.

Since 1880, the use of foundation caissons, sunk under compressed air, has been fairly general; the tidal quay alongside the entrance channel, the lock leading into the Western Basin, the jetties and the South Quay of the First Dock in the Western Basin, have all been done by this method.

In the case of the works recently carried out in connection with the under-pinning of the South Quay of the Second Dock in the Western Basin, the engineers have adopted for the first time a type of wall with anchorage in the rear, in place of the classic type of solid wall. The under-pinning—or rather toe-supporting—of this old quay consisted in driving in front of it a line of thin reinforced concrete sheeting, held back at the top by anchor rods to groups of raking piles. For the extension of this under-pinned wall, in 1934, they reverted to the type of solid wall with projecting base of concrete reinforced with old rails. This work was the first occasion when trial was made at Calais of the process of draining the ground to be excavated by lowering the water-table.

c. Maritime Station.

The station occupies a 560-metre length of quay, comprising four mooring berths, with a depth of water alongside of from 4½ to 5 metres (15 to 16½-ft.) which is ample in view of the draft of the Calais-Dover steamers being 3 m. 85 (12-ft. 9-in.) at most. This quay is furnished with three cranes, of 5-7-ton capacity, belonging to the Northern Railway Company.

The whole of the station ways and works are now in process of transformation, under a programme involving expenditure of 23 millions of francs, to be raised by special temporary local taxation. The main building, 186 m. long and 16 m. wide (610-ft. by 52-ft.), has on either side the five tracks allotted to passenger trains, the total effective length of which will be 2,670 metres (1¾ miles) when the extensions are completed. Each of the platforms, the width of which is to be increased to 8 m. alongside the building, instead of 4 to 6 m. as hitherto, will be covered by verandah roofing for a length of 300 metres. A covered gallery, 280 m. long, glazed on the harbour side which is exposed to westerly winds, is to be constructed along the quay; so that the transit of passengers may be entirely under cover right out to the embarkation gangways. The main building will include a baggage examination hall, 53 m. by 16 m. (174-ft. by 52-ft.), and a hotel.

Port of Calais—continued

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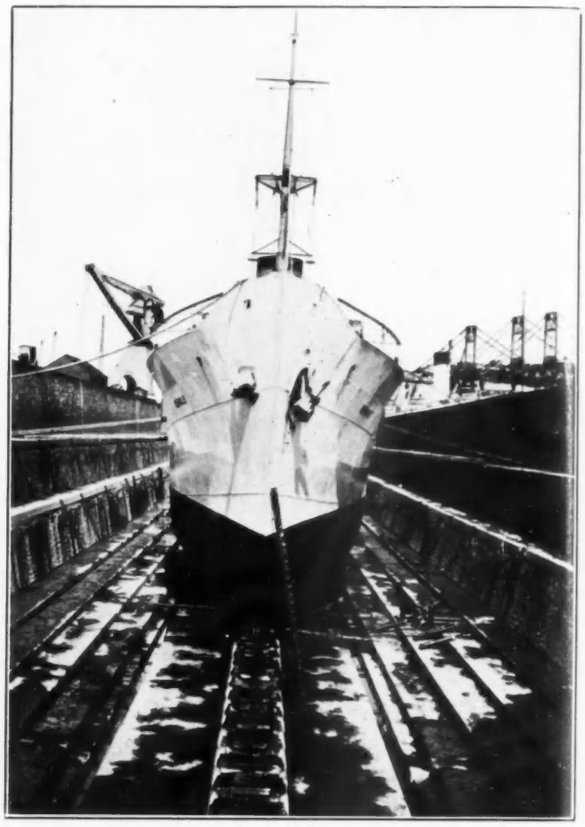

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Port of Calais—continued

The length of the service sidings (standing, inspection and overhaul) will amount to 2,265 m., or nearly 1¼ miles. The complete installation enables ten trains to be despatched in succession from a single steamer service. The main lines connecting with the station run into separate platforms with barriers, an arrangement that gives great advantage in point of speed. The various operations of landing and boarding, customs examination, police inspection, etc., are conducted with such rapidity that the process of transfer between train and boat is reduced to 13 minutes.

d. Cranes of the Chamber of Commerce.

These number 63, not including the pillar crane serving the graving dock. They comprise a very large proportion of modern machines (45 per cent. being less than 12 years old).

Landing Pit Props in the West Dock.

of high power (70 per cent. being over 3-ton capacity), designed to suit the speedy operations that maritime traffic now demands (69 per cent. are equipped with level-luffing gear and 62 per cent. provided with double-barrel winches for working with automatic grabs); the table hereunder summarises the characteristics of 27 cranes, installed since 1930:—

No.	Maker	Date	Capacity	Radius
8	Caillard	1930	6 tons	19m.
6	Demag	,,	,,	92½m.
5	Applevage	1936	3 tons	28m.
4	Caillard	,,	,,	23m.
2	Paindavoine ...	,,	6 tons	23m.
2	,, ...	,,	10 ,,	23m.

The six 6-ton Demag portal cranes with adjustable jib, are specially suitable for the transfer of cargo from ship to barge or from ship to ship. The average hourly tonnage output, in normal service, varies between 60 to 80 tons per minute for bulk cargo, such as ore, coal or phosphate, handled by 6-ton cranes, and 25 to 35 tons per minute for pit props and paper-making logs discharged by 3-ton cranes.

These machines, excepting five old hydraulic cranes, are supplied with three-phase current, at 220 or 380-volts, from eight transformers, the aggregate power of which amounts to 4,400 k.v.a.

e. Ferry-boat Berth.

This accommodation, installed in 1917 at the South-East corner of the Carnot Basin for the requirements of the British Army, and put to service again in 1930 for commercial use, is composed of a double-track gangway, 30½ m. long, which is lowered and lifted by means of an electric winch. The vessels accommodated are 107 m. in length, 18¾ m. in overall beam, and capable of carrying 32 covered wagons specially built by the French railways to run on English lines.

f. Sundry Equipment.

Mention may be made of the following:—

Two petroleum installations, let to companies and comprising tanks, pump stations and pipe lines.

Apparatus for shipping, on cable-laying ships, submarine cables manufactured in Calais by the S.I.T.

An installation for the storage of bananas in bulk, placed inside the Crespin shed by the Chamber of Commerce, and provided with complete air-conditioning plant, the area covered being 1,280 sq. metres.

g. Dry-dock Accommodation.

The port possesses a graving dock of 153 m. effective length and 21 m. width, with sill at—1.78. This dock is closed by a floating caisson. Pumping is effected by means of three pumps driven by two steam engines of 325 h.p. each.

h. Means of Distribution.

The storage areas are served by 45 kilometres (28 miles) of railway tracks, connected at three points with the general railway system. These tracks are provided with weighbridges to effect rapid weighing of the 40-ton hopper wagons, which form the 800-ton trains for conveyance of ore destined for the steel works of the North and East.

Every part of the docks moreover, is in communication by locks and passages with the boat basins and the Calais-St. Omer Canal, by which the port is linked up with the navigations of Northern France and of Belgium. The dimensions of these works allow the passage of Flemish barges laden to 280 tons. Haulage to St. Omer is effected by Diesel-driven tow path tractors.

IV—Extensions in Hand or Projected

Underpinning the Maritime Station Quay.

This proposed improvement is not, properly speaking, an extension of the port. It is only intended to adjust the most important structure of the existing accommodation to meet present-day traffic conditions. The quay was in fact originally built for a depth alongside dredged to—3.30; this level has been progressively lowered to—5 m. and the disturbance of the sandy bottom by ships propellers has formed a hollow at the toe of the wall going down to—6 m.

In consideration of settlements observed behind the wall which are attributed to the escape of sand between the monolith wells, on which the wall is founded, it appeared necessary to put down in front of the wall a line of sheeting to form a cut-off. This sheeting, or curtain, wall is to be formed of sheet-piling attached to the wall itself and sunk to—13 m. The under-pinning or toe-protection will be supplemented by the filling up of the openings originally formed in the thickness of the wall to facilitate the embarkation of passengers at low tide on the small paddle steamers then in use, and which, being now disused, are an occasion of fruitless expense in maintenance and in damage to vessels when coming alongside in rough weather. This work is expected to be completed by the middle of 1937.

Opening of a New Outer Basin with Tidal Quay and Ferry Dock.

There are two purposes to be served which justify this project, which has been initiated by the Chamber of Commerce and is to be financed by port dues:—

(1) The conveyance of passengers and goods by train-ferry seems likely to become a more general practice in coming years. The Southern Railway in England has recently had three boats built, of 2,800 tons, which are specially adapted to this traffic and it is natural that the Port of Calais, the geographical situation of which places it in a privileged position in regard to Anglo-French transport, should be concerned to receive these vessels. The present berth, placed as it is at the inner end of the basin, does not answer to the requirements of a regular service to time table, and it becomes necessary to create a special ferry dock in direct communication with the Outer Basin.

(2) General traffic suffers from the limitations of the single tidal quay available, apart from the maritime station quay, be-

Port of Calais—continued

because the multiple uses to which it is put give rise to great difficulties in practice. Considering the continuous increase in the dimensions of cargo boats the maintenance of traffic in heavy bulk cargoes, which constitutes an essential feature in the trade of the port, renders it necessary to form another tidal quay having alongside a depth of—10 m. and thus capable of berthing at any time ships drawing 9½ m. of water.

The programme laid down to respond to this double need, includes in its most recent form the excavation of a new outer basin occupying a part of the site of the present Eastern Flushing Basin, from which will open the ferry-boat dock and around which will be formed a tidal quay 300 m. long having a depth of—10 m. alongside. The present channel, as well as the new outer basin, will themselves be dredged to—6 m. so as to allow vessels drawing 9½ m. to come alongside at half-tide.

The execution of this programme will entail the demolition of the sluice which now closes the flushing basin; this work, as well as the construction of the breakwaters on either side of the access channel to the new outer basin, is to be carried out within the protection of a two-skin sand-filled dam joining the knuckle of the Tidal Quay with the pierhead of the East Jetty.

The ferry-boats will be berthed in a dock of dimensions not much larger than the boats themselves (length 116 m., width 21 m. 80, invert at—5 m.), closed by rolling caissons Within this dock a powerful pumping plant will effect in less than 15 minutes an adjustment of the water level to a predetermined height, according to the draft of the vessel. The water having been levelled up, connection with the lines ashore may be made by means of a short bridge without excessive gradients. The work will be done in the dry after lowering the "water table" or surface of standing water in the ground.

The Tidal Quay, 300 m. long, will be backed by an area of reclamation about 80 m. wide, upon which can be installed plant suitable for handling and storage of heavy bulk goods, or of miscellaneous cargo when required. As to process of execution, two methods are under consideration; either hydraulic excavation within reinforced concrete caissons, of which the wells would be filled with sand, or else a composite construction comprising a reinforced concrete wall, with counterforts and sole slab carried on piles, to serve as a mooring quay, and a curtain of sheet piling to retain the filling.

V—The Traffic of the Port

a. Anglo-French Traffic.

This traffic is the "raison d'être" of the port of Calais; it was to meet this need that it was created; it is to satisfy the growing demands of this traffic that the port has been continually improved.

There are now, in each direction:—

(a) Two services daily of steamers for conveyance of passengers, baggage, motor cars and mails. One of these services is run under the French flag by two boats—the "Cote d'Azur" and the "Cote d'Argent"—belonging to the G. A. Company, and the other by the Southern Railway Company with the "Canterbury" and similar vessels. The leading features of these ships are as under:—

	Cote d'Azur Cote d'Argent	Canterbury
Length	103m	102m. 50
Beam	14m. 70	14m. 20
Gross Tonnage	3,046 tons	2,910 tons
Indicated horse power ...	14,260 h.p.	9,300 h.p.
Speed in knots	23	22

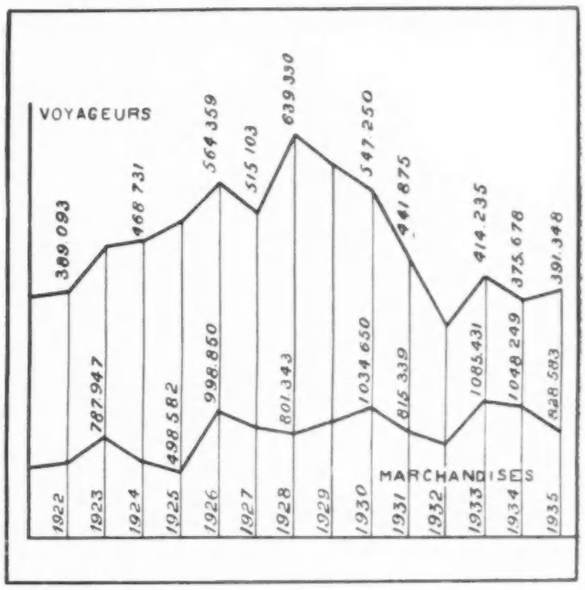
(b) During the summer season (1st April to 1st November), two services daily of steamers fitted specially for the transport of motor cars, the "Forde," of the Townsend Auto Transport Company, and the "Autocarrier," of the Southern Railway Company. These services are often doubled or trebled on Saturdays and on the days before and after holidays.

The numbers of motor cars carried has increased, in spite of the economic depression, as is shown by the table below:—

Year	No. of Motor Cars passing through Calais
1931	9,123
1932	6,687
1933	8,883
1934	7,182
1935	12,715

(c) Two services daily, to Dover, by cargo-boats of the Southern Railway, and a service—bi-weekly or daily, according to the season—to Harwich, run by the French Ferry-boat Company. The cargoes carried by this latter service consist principally of fruit and early vegetables, from France and Spain, which are conveyed by this route under conditions of exceptional speed.

The diagram here reproduced shows the fluctuations of the passenger traffic since 1913.



b. Goods Traffic.

The accompanying diagram shows the total traffic—inward and outward added. The chief features of this traffic are:—

Import.

Timber and its products (pit props, paper-making logs, sawn scantlings, wood pulp), of which the quantity landed amounted to 523,283 tons in 1930 and 269,184 tons in 1935. Calais offers favourable conditions for such traffic, because of the extensive areas available for storage, especially of pit props, which have to be sorted before re-export. The capacity of such storage, counting only the areas commanded by handling machinery, is about 60,000 tons.

Ores, principally manganese (101,887 tons in 1935), and resin (165,000 tons in 1934), heavy bulk goods, to deal with which there is suitable machinery, in the form of 10-ton and 6-ton cranes fitted with special grabs, phosphates, nitrates, etc.

Export.

Coal—167,757 tons in 1935—mainly consigned to other French ports and those of North Africa, and building materials, 36,384 tons in 1935.

Lastly, may be noted the recent development of trade in bananas imported from Cameroon and the export of straw in banana ships to the Canaries.

To conclude this review, the following analysis is given to show the relative volume of inland transport by rail and waterway (the sum of inward and outward figures, added):—

	BY RAIL		BY WATERWAY	
Year	Tonnage	Percentage	Tonnage	Percentage
1930	752,476	80	235,581	20
1931	616,170	82·5	130,794	17·5
1932	443,771	66	226,015	34
1933	623,437	69	284,534	31
1934	496,574	57	381,150	43
1935	396,616	55	327,396	44

This table shows the growing importance to Calais of its connection with the inland waterway system.

Erratum.

Regarding the advertisement of Sir Wm. Arrol and Co., Ltd., of Glasgow, appearing in our last issue, George Ellson, Esq., O.B.E., M.Inst.C.E., was named as the Consulting Engineer instead of as the Chief Engineer of the Southern Railway.

Ipswich Dock Improvements.

A dredging contract for the improvement of the Port of Ipswich and its approaches, involving the removal of approximately 300,000 cubic yards of material, has been placed with Messrs. Tilbury Contracting and Dredging Co., Ltd. The work, which will take several months, is being commenced immediately.

Warehousing at Ports

By D. ROSS-JOHNSON, C.B.E., M.Inst.T. (formerly General Manager, Port of Bristol)

THERE is no department in the organisation of the Port Authorities of Great Britain in which there is so much difference of policy as in the methods of dealing with the storing and warehousing of goods in the course of transit between the producer and the consumer.

This storage is, of course, a necessary stage in the process. The stages are: delivery to the ship, transit across the ocean, the discharge of the ship, the sorting of the cargo for delivery to the owners, and the further despatch by inland carriage to eventual destination. And, of course, there may be many destinations for each consignment, whether a whole cargo under charter, or a parcel arriving with many others in a liner.

Importance of Prompt Ship Discharge.

The importance of this stage will be realised if it is appreciated that the primary object in every port is, or should be, the " despatch " of the ship. A ship represents the investment of a large sum of capital which is only earning interest while it is proceeding on its voyages, and is infructious while it is laid up in port. So it is essential to keep the latter period down to the minimum. For this reason, it is necessary so to organise the work of the port that the process of discharge (or loading as the case may be) shall go on with the utmost expedition. To do this, it is not only needful to provide and use the appliances for getting the cargo as rapidly as possible out of the ship, but to see that a clear space is continuously available for its deposit on the quays or in the sheds. As, owing to the structure of the vessel, it is generally impracticable to discharge in the order in which the goods have been loaded, they have to be sorted out as they are landed. This is the function of sufficient and properly-designed transit sheds, which is not the subject of this article, but it has to be referred to in order to show the need for some accommodation outside of, but readily accessible to, the transit sheds to which the cargo, as sorted, can pass on. And to carry this out at the least possible cost is an essential only second in importance to that of giving despatch to the ship.

Storage and Distribution of Goods.

As just pointed out, the goods which arrive under one Bill of Lading may have to be distributed by the importing merchant to his buyers scattered all over the country. He needs time for this; he may not have sold the goods before they arrive; he may want to hold them on account of market fluctuations or for many other reasons. Very often he is sanguine enough to hope he can sell his goods direct ex-ship; finds the transaction takes longer than the free time allowed under the byelaws of the Port; is not interested in the fact that his goods are cumbering the quay and injuring the interests of the shipowner; and then feels himself aggrieved when the Port Authority, as the impartial arbitrator, has to apply to him the rigour of the law. So to keep down friction from this cause, it is desirable that the merchant should have available cheap and easy warehousing facilities.

Or if he, or his purchaser, finds he must keep his goods on hand for some time, but wants to make use of the money they represent, he can borrow from his bank on the security of the goods, which is done by means of a " Dock Warrant," which is a certificate such the warehouse keeper will not part with the goods except on production of the warrant. Clearly such a document will not be accepted by a bank, except when issued by a public authority or a substantial firm.

Again, many commodities may not arrive in the condition in which they have to be marketed; they may have to be tested or rearranged, to be split up or combined with other consignments. Often some process of what may be called semi-manufacture, or grading, may have to be applied.

Some commodities, e.g., meat and fruit, are very perishable and have to go without delay into stores specially provided for their preservation.

And, not least important, many classes of goods are dutiable. The merchant does not want to lock up capital and lose interest on such goods during the more or less protracted period until he sells them, and therefore leaves them temporarily under the custody of the Customs Authorities in bonded warehouses.

For these and many other reasons, the provision of suitable warehouse accommodation in close proximity to the ships' berths and affording cheap means of transfer, is essential in every port which wants to attract business.

This broad principle is generally accepted, but the method of applying it varies widely. In some cases, the Authority provides the accommodation; in others it is left to private enterprise. In some, it is situated on the Docks Estate; in others, it is outside, but as adjacent as possible.

These differences of policy are mainly due to historical reasons, to physical reasons and to differences in the growth of ports from the very earliest times. It may be helpful to quote a few examples.

Warehousing at London.

London is the oldest as well as the greatest port in the United Kingdom, and it has been fortunate in its historian* It is also the port which has most largely developed the warehousing side of the undertaking, and the following is a brief account taken mainly from Sir Joseph Broodbank's history, of its evolution.

For centuries before the advent of the docks and the riverside wharves, the trade of half England was conducted on London's river, the ships lying in the stream (The Pool of London) and discharging into boats, which carried the merchants' cargoes to their premises up and down the banks. Then, many traders found it more convenient to entrust the work of landing their goods to some of these owners of waterside premises, rather than maintain premises of their own, and so the former developed the custom of handling other people's goods. So, a new industry was started and became recognised in Acts of Parliament, that of a Public Wharfinger. The need, as explained above, of clearing the quays was very speedily discovered, and so the Public Wharfinger developed by natural process into the Public Warehousekeeper.

Gradually, many of these began to specialise in certain classes of trade, and this fixed the sites of the adjacent markets, many of which are now household words.

The seventeenth century saw the establishment of the great trading guilds, of which the best known were the Hanseatic Leage, whose depôt in London was the famous Steelyard, and the English East India Company. As they concentrated the trade, in the one case with Northern Europe and in the other with the Far East, they established large warehouses in the City to contain their merchandise. With the disestablishment of these in the eighteenth century the Dock Companies took over these warehouses, which, in due course, were absorbed in the Port of London Authority. So we find the anomaly that this Authority is the owner of a large warehouse establishment far removed from its docks.

As these docks were extended down the river, out of the City trading area, the Dock Companies and their successors, the Port of London Authority, had to provide their own warehouses. But the old river wharves with their warehouses, modernised and developed, remained in private hands. There is no space here to describe the conflicts between the two; they are fully explained in Sir Joseph Broodbank's interesting history. But it will be agreed that the existence of the two systems is a benefit to trade, as providing, on the one hand, the spur of competition, and on the other, the power of the Authority by adjustment of its charges to prevent any spoliation of the public.

Practice at Bristol and Liverpool.

At Bristol, the next ancient port to London, the history runs on somewhat similar lines. Round the old City Docks private enterprise had provided facilities before the first Dock Company was heard of, and that had little available land and was fully occupied with the development of its own estate. But when the other Companies constructed the modern docks at Avonmouth and Portishead, they had to provide all their own accommodation, which was largely developed by the Bristol Corporation after they had acquired all the Companies, and the dual system which has been maintained has not been unsatisfactory.

The growth of Liverpool was on different lines. From the time of its much later beginning, ships were discharged on its banks, and private enterprise established warehouses sufficient for the needs of the time, behind and adjacent to the berths. After the Mersey Dock Board came into existence and gradually converted the river bank wharves into a chain of docks, it was their policy not to compete with these vested interests, which had improved and expanded as need arose. Though circumstances have forced the Board to undertake a certain amount of

* See Sir Joseph Broodbank's History of the Port of London.

Warehousing at Ports—continued

warehouse construction, e.g., the wool warehouses and granaries, this has never been one of its main activities as in the case of London. But it has in later times realised both the need for being more self-contained, and for economy in cost of movement between quay and warehouse. So, in their more recent works, they have provided additional floors in their transit sheds to which goods can be rapidly and cheaply moved and stored on warehouse terms, in order to keep the lower floors clear for transit goods and maintain unencumbered floor space for the cargo as it comes out of the ship.

Practice at Manchester.

For the Manchester Ship Canal the problem was different. Here, the Canal Company were, in quite modern times, converting an old manufacturing inland city into an ocean port. They had no vested interests and established industries to consider, and they had taken the precaution of acquiring a large area of land adjoining their ship-discharging and cargo-handling areas. Also, they wisely obtained statutory powers which enabled them to keep all the operations in their own hands, from the ship's arrival until the goods went away to their final destination by rail, road or water. They enlisted private enterprise to their aid, and on their spare land has grown up, not only warehouses, but factories consuming raw materials imported through the port. And the Company took care to provide cheap and efficient means of transport between ship's side and warehouse and factory.

But Manchester is alone among English ports in possessing this statutory monopoly, and in many ports of the United Kingdom the tendency is to leave the provision to private enterprise, or even in Ireland, to suggest that the Government should fill the void. But they have generally found themselves obliged in self-preservation, to provide a greater or less amount of accommodation.

Unfortunately, Port Authorities are not prone in their published reports to take the public too much into their confidence. There are no statutory uniform accounts as in the case of the railways, and it is impossible (with one or two notable exceptions) to ascertain from their published reports and accounts what proportion of revenue is attributable to this branch of their activities.

Recent Developments.

Whether publicly or privately administered, the whole physical aspect of the problem has completely changed within the last generation. In the last generation, a warehouse was nearly always a building of many floors, with perhaps vaults or cellars below ground level, and with hoists suspended from the roof for the reception and delivery of goods through doors on each floor. Now nearly every trade is specialised and has its own type of store. The floor warehouse is practically confined to case goods, and the hand-operated hoist has been replaced by power-operated cranes and lifts. Grain is worked in bulk by elevator and conveying bands to silo granary; oils in pipe lines between ship and tanks; meat, fruit and fish and other goods needing cold storage are kept in specially constructed refrigerated stores. And these refinements have emphasised the need for the store to be as close as possible to the ship's berth, for the reasons that it is necessary to keep as short as possible the time of exposure on the journey of delicate goods, and to keep down as much as possible the cost of the expensive conveying plant. And, of course, if the store is so far away that another transport agency has to be made use of, there is an additional item of cost to be recovered in the price.

So the position and the size as well as the intake and output arrangements always need careful planning, the first test being to keep down the cost of transport between ship and store. If the latter is too large for the cargoes from the immediately adjacent berths, it is either left unfilled, or it has to be filled with cargo from more distant berths at greater cost of carriage; or if not large enough to take in all the cargo from its own berths, the surplus has to be stored elsewhere at greater cost. And it must be so designed that the operation of taking in, generally on a wholesale scale, and of delivery for despatch to destination, often in small parcels, can be carried on simultaneously without the consignees getting in each other's way. For at the warehouse, as at the ship's side, congestion is the greatest enemy to economy.

Effect of Transport Methods.

A factor which has had a material influence on warehouse design in recent years has been the increasing use of road transport. In many places, the installation has been arranged for rail and water transport only, and the provision of accommodation for road vehicles has been found difficult. In all the more modern buildings, of course, road transport has been provided for.

Another factor which always has an important effect on the working of a port, and especially on the design and location of its warehouses, is that of barge transport. The extent of this varies very greatly in different ports. For instance, in London more than half the port tonnage is handled by barge, most of which never touches the quays at all. If London had to pass all its traffic over its quays, it would find its facilities, generous as they are, totally inadequate. In Liverpool, a much smaller proportion of its tonnage is handled by barge. In some ports, e.g., the railway ports in South Wales, hardly any is sent away by water. It is unnecessary to enlarge on how this must affect design.

But, in all ports, barges are used to some extent during the ships' working, loading and discharging—because it is thus enabled to work on both sides and so double its speed. The economical disposal of these barges is another matter which has to be taken into account in designing the warehouses. English ports have still a good deal to learn from Hamburg, Rotterdam and other Continental ports in regard to the use of their water surfaces.

Port Factory Areas.

As the methods of handling different commodities have become more and more specialised and competition has enforced consideration of economy in handling, the advantages have become more apparent to the manufacturer of establishing his factory or mill within the area of the dock estate. This will be apparent if we set out the operations which have to be performed and paid for, from the stage of discharge from the ship and eventual despatch to the consumer.

If the factory is at an inland town, the goods must incur the cost of (1) landing, (2) haulage to the boundary for delivery to the railway company, (3) the railway rate to the inland town, (4) cartage from the railway station to the factory, and (5) the railway rate to destination.

But if it is in the dock estate, it only incurs (1) landing, (2) haulage to factory, and (3) railway rate to destination.

The realisation of these economies has led to a continuous shifting of mills and central distributing depôts from inland to the coast, generally within the port areas. Any one can see this for himself by inspecting the number of new mills lately arisen in the area of nearly every port.

The War Menace.

But a new and serious issue has now arisen. The need for preparation against a sudden outbreak of war is generally accepted, and attention has already been drawn to the danger of keeping the greater part of our reserves of foodstuffs in the larger ports. When it is decided, as it will have to be decided, that our food stocks are to be stored in smaller depôts all over the country, the question of transport will have to be recognised as one of the determining factors in their location.

Some are still alive who had experience of the problem in the Great War. Under the convoy system, all the imports arrived in gluts and concentrated in a few ports. The agents of the Food Ministry scoured every town and village in the country in search for buildings which could be utilised as stores. But when these were found the problem of transport remained, with railways and roads congested with war traffic and a general shortage of rolling stock. The economic waste was enormous and, what could not be measured in money, the loss of food through deterioration and the delays to shipping wanted to make another voyage.

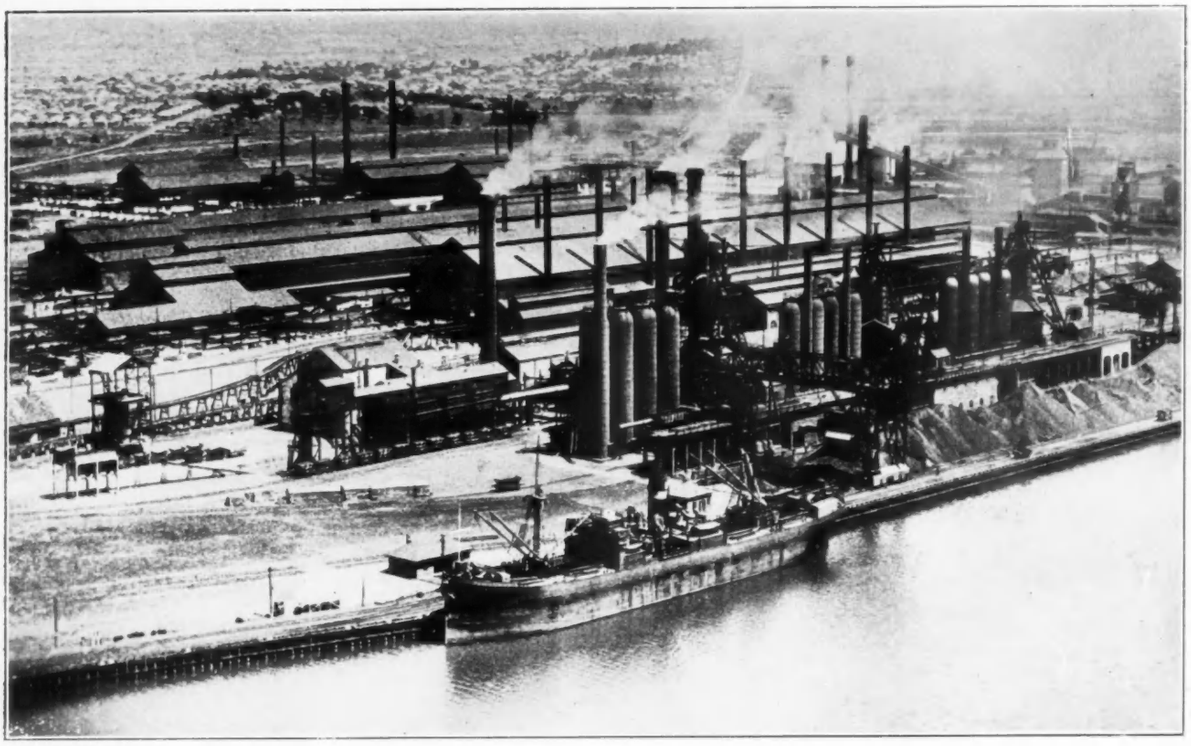
If it is decided to provide these inland depôts and warehouses, a careful selection of sites should enable the food supply of the country to be maintained by water carriage without any demands on overloaded rail and road, except for the short journey from depôt to consumer.

Discharge overside is the cheapest method of getting cargo out of a ship, and the barge is the cheapest method of transport to all inland points which can be reached by water and where speed is not of first importance.

The principal ports are all to be found on the estuaries of important rivers such as the Thames, Severn, Humber and Mersey, from which by canals and canalised rivers nearly all parts of England can be approached. Some of these waterways have been allowed to silt up and some to become derelict, but schemes are in the Government pigeon-holes for restoring a system of canals which would serve very nearly the whole country. They have always been put away on the ground of expense, but the estimates are trifling when measured against the money now being spent on roads and on armaments. For a comparatively small expenditure, the bulk of the transport from port to depôt could be effected by water, to the saving of road and railway.

A scheme to enable the country to be fed in time of emergency, without taxing the land transport facilities, will be well worth the attention of the Government.

New South Wales



The Steel Works, Newcastle, New South Wales.

Circular Quay, Sydney, New South Wales.

Maritime Services Board of New South Wales

First Report for the Year ended 30th June, 1936

(Abridged)

This is the first report of the Board, which was brought into existence by the "Maritime Services Act, 1935," and commenced to function on the 1st February, 1936. It was constituted on the lines recommended to the Government by the Maritime Services Co-ordination Board in its report of the 27th October, 1933. The object of the constitution of the Maritime Services Board is expressed in the preamble of the act in the following terms:—

"To provide for the constitution of a board to be styled 'The Maritime Services Board of New South Wales'; to provide for the exercise and discharge by such board of the powers, authorities, duties, functions and obligations of the Sydney Harbour Trust Commissioners; to provide that such Board shall be charged with the administration of the Navigation Act, 1901, and certain other Acts; to confer and impose certain other powers, authorities, duties and functions on such Board; to amend the Sydney Harbour Trust Act, 1900-1931, the Navigation Act, 1901, and certain other Acts in certain respects; and for purposes connected therewith.

The principal changes resulting from the passage of the "Maritime Services Act, 1935," were the following:—

(1) The vesting in one body of the control and management of all the ports of New South Wales, with the exception of Port Kembla, and the exercise by the same body of the general powers of a navigation, pilotage, and conservancy authority with jurisdiction over all navigable waters in the State;

(2) the recognition by the Government of the principle of granting representation on the controlling body to shipping and mercantile interests concerned in the provision and administration of the port facilities;

(3) the creation of a statutory Advisory Committee for the Port of Newcastle, comprising representatives of local business interests, with an independent chairman.

Functions of the Board

General.

Power had been vested in the former Sydney Harbour Trust to design and carry out improvements which it considered necessary at the Port of Sydney, and the Maritime Services Board now exercises that power. In the case of Newcastle and outports, such a function had never been vested in the Superintendent of Navigation, but was the responsibility of the Department of Public Works. There was, however, close collaboration between that department and the Superintendent of Navigation in regard to the maintenance and improvement of the port facilities outside Sydney. That position still obtains, the powers of the Board at Newcastle and the outports being confined to general navigation functions and the collection of revenue. All engineering work, including dredging at Newcastle and outports, is outside the ambit of the Boards functions. In the case of Port Kembla the general control of the port is exercised by the Department of Works and Local Government, with which leases for shipping purposes and trade facilities are arranged. That department also acts for the Board in the collection of dues under the "Harbour and Tonnage Rates Act, 1920," and the enforcement of harbour regulations under the Navigation Acts.

When the Bill creating the Board was before Parliament, the Minister explained that it was the intention of the Government to constitute the Board as a first step, and at a later date introduce further legislation dealing more specifically with the recommendations of the Maritime Services Co-ordination Board in regard to the future administration of the port and navigation services of the State. Such recommendations, however, would, he explained, be reviewed in the first instance by the new Board in the light of its working knowledge of the maritime affairs of the State.

Financial.

As provided for in the "Maritime Services Act, 1935," the finances of the Port of Sydney, to the extent that they were previously under the control of the Sydney Harbour Trust, have continued to be kept separate from the Consolidated Revenue Fund of the State. The finances on the "navigation" side continue, as before the 1st February, 1936, to form part of the Consolidated Revenue Fund and include such figures as those relating to pilotage and Harbour and Light Rates at the Port of Sydney.

Work of Amalgamation.

The amalgamation of the Sydney Harbour Trust and the Navigation Department was effected without any untoward difficulty. The entire staffs of both bodies were placed by the "Maritime Services Act, 1935," under the sole control of the Board, and early steps were taken to accommodate them in the one building. The members of the clerical staff of the Navigation Department were accordingly transferred to the office of the former Sydney Harbour Trust, but in order to accommodate the professional staff it was necessary for adjacent premises belonging to the Board in George Street, and which had been occupied by tenants, to be converted into offices, and a connection made with the main building; thus the staffs of both bodies have been placed virtually under one roof, with considerable saving of time to the Commissioners and officers and with other administrative advantages.

Additional work has resulted which has been due, first, to the adjustment and unification of two distinct administrative and accountancy systems, and, second, to the collection and preparation of information to enable the new Commissioners to be fully seized with the facts relating to matters under review and to permit of the Board satisfactorily dealing with many matters which had been in abeyance pending its constitution, including the review of the recommendations of the Maritime Services Co-ordination Board and the co-related functions of the former Sydney Harbour Trust and Navigation Department.

The Commissioners have taken the opportunity in connection with the filling of certain vacancies which have arisen on the staff of effecting adjustments of duties and other changes which will make for greater economy and efficiency, thus promoting the objective of the Government in amalgamating the two bodies.

Inspection of Newcastle and Outports

Newcastle.

Shortly after its appointment the Board paid an official visit to Newcastle, and spent several days in making official contact with the representatives of local, public and business interests and in acquiring a personal knowledge of the port and its problems. It was explained by the President that the Board was anxious to work towards the betterment of the facilities necessary to enable the expansion which lay ahead of Newcastle and district to take place without restriction. Definite help in that direction would, he pointed out, result from the creation of the Port of Newcastle Advisory Committee, to which the Board would look for definite and carefully considered recommendations, based upon an intimate knowledge of and a vital interest in the developmental and other problems which would call for solution.

Outports.

In April the Board made an official tour of inspection of the ports of the far North Coast, and in June visited the remaining ports north of Sydney. Though outside the period covered by this report, mention is made of a third tour of inspection at the end of September which embraced the ports of the South Coast. The object of these three tours was, first, to enable the Board to inspect the establishments under its control along the coast; second, to make themselves personally acquainted with the members of their staff at the various stations; third to obtain first-hand evidence of the problems associated with the maintenance and development of the ports; and fourth, but not least important, to meet representatives of local interests and ascertain their views regarding the port facilities generally and the conditions, immediate and prospective, of the trade carried on.

The Board was accompanied by the Principal Engineer for Harbours and Rivers, Department of Works and Local Government, whose long, intimate and specialised knowledge of the conditions of the various ports was freely made available to the Commissioners and deeply appreciated by them. The District Engineers of the Department mentioned also accompanied the Board when in their respective districts.

Public bodies in most of the districts visited took advantage of the occasion to meet the Commissioners and make representations to them in regard to the improvement of the facilities available at the various ports.

The report was signed by the Commissioners of the Board, Messrs. E. W. Austin (President), G. D. Williams (Vice-President), V. O'Connor, G. C. Boehme and D. J. Mackay Sim, and S. C. Barnes, the Secretary to the Board.

We have received an interesting brochure from Messrs. The Renold and Coventry Chain Co., Ltd., Renold Works, Manchester. The booklet consists of 20 well-illustrated pages and actual instances of saving by Renold chains in all branches of the municipal field are described.

The Coronation

The following is a short description of the celebrations held at various ports in the British Isles to commemorate the Coronation of Their Majesties King George VI. and Queen Elizabeth:—

LONDON.

The Home Fleet visited the Port of London from May 7th to 13th and was officially welcomed on arrival by Lord Ritchie,

Photo, F. C. Ivory, by courtesy P.L.A.

Floodlighting Port of London Authority Head Office, Trinity Square, London, E.C.3.

of Dandee, and members of the Port Authority. The port also offered direct hospitality to visitors from the Empire and from foreign lands by providing berths for a number of cruising and other ships, bringing spectators to view the historic event.

The London County Council undertook the arduous task of assembling on Victoria Embankment 37,000 children from their schools to view the procession, and more than 2,000 of them were transported by river to Westminster Pier from Cadogan Pier, West India Dock Pier, Commercial Dock Pier, Tunnel Pier, Cherry Garden Pier and Tower Pier.

A detachment of 100 of the Port of London Authority Docks Police Force assisted the Metropolitan Police to line the route along the Embankment and Northumberland Avenue, and contingents of boys to view the procession and in some cases to line part of the route, were sent from most of the training ships moored on the tideway. The T.S. "Worcester" at Greenhithe hoisted between fore and main masts the Royal Monogram and Crown, about 20-ft. in height picked out in red, white and blue lamps. Ingress Abbey, the shore establishment of the "Worcester" provided one of the prettiest floodlit sights on the river. H.M.S. "President," London Headquarters of the Royal Naval Volunteer Reserve, was illuminated and dressed overall with masthead flags.

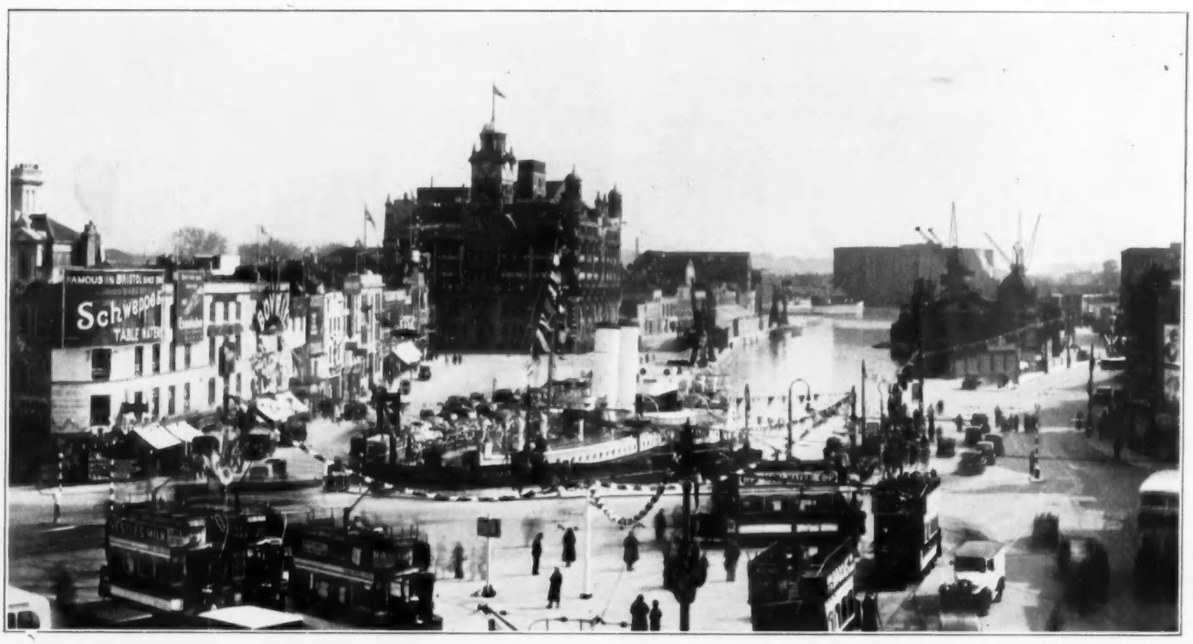
Regarding the celebrations of some of the different outports of the Port of London, Southend provided lavish decorations and public illuminations. There was lighting and a firework display at the pierhead, also a processional pageant along the sea front from Westcliff to Southend, which consisted of historical tableaux depicting the history of this part of Essex from 50 A.D. to the present day.

At Gravesend and Tilbury several prominent buildings were floodlit, Tilbury Passenger Landing Stage was decorated and in the evening there were a number of torchlight processions and firework displays. Woolwich gave a searchlight pageant of history in which more than 1,000 players took part.

Floodlighting on the Royal Naval College, Greenwich, provided a magnificent spectacle from the river, the river frontages, the Grand Square, the Colonnades and the Queen's House appearing in vivid relief. Greenwich Pier was illuminated by festoons of coloured lights. Many other prominent buildings were floodlit, among them being the Tower of London, the Port of London Building, Trinity House, Tower Bridge and County Hall.

BRISTOL.

As befits its ancient traditions, the Port of Bristol did its part in displaying loyalty to King George VI. on the occasion of his Coronation. The Head Office of the Authority in Queen Square was gaily dressed with bunting, the Union Jack taking the premier position on the building while the City Flag commanded the frontal decoration. In addition, all the windows and balconies were filled with a wonderful array of flowers and flowering shrubs which had been brought from the Corporation Glass Houses, Blaise Castle Estate. The offices were used as an assembly room by civic dignitaries and others who took part in the procession to Bristol Cathedral on Coronation Sunday. One item of special interest which could



Bristol: Coronation Decorations at Tramways Centre and Floating Harbour, with P.S. Cambria moored at Broad Quay.

The Coronation—continued

not find its equal in any port of the country was the arrival in the centre of the city itself of the steamers "Devonia" and "Cambria." They were moored at the Broad Quay, and this will probably be the last occasion on which a steamer will lie at this berth as a bridge is about to be constructed across the Floating Harbour at this point.

There was a liberal display of bunting on all the vessels at the City Docks and the many riverside premises were gaily beflagged, among them being the famous Inn the "Llandoger Trow," on the Welsh Back, which dates from 1600.

At the Avonmouth Docks the same emblems of loyalty were shown. All the mills were flying the National Flag and the vessels in berth did their share to make May 12th a National occasion.

The day was declared a public holiday and all employees received a full day's pay. The casual dockers were not forgotten, as the Port of Bristol Employers' Association raised a voluntary fund and all registered workers, numbering about 3,000, received the sum of 5s. each. This scheme will not affect the men's unemployment insurance benefit.

Head Office Port of Bristol Authority.

BELFAST.

On the occasion of the Coronation, the Harbour Office Belfast, in common with other public buildings in the City, was lavishly decorated. From the five flag poles surmounting the buildings the Union Jack and flags representative of the Marcantile Marine and the Royal Navy were flown, whilst along the entire front of the building at first floor level, groups of Empire flags set at intervals with the intervening spaces decorated with red bunting combined to give a colourful show emblematic of the loyalty to the Throne of the Belfast Harbour Board. The illustration gives a good view of the scheme of decorations described.

All vessels, both British and foreign, in Belfast Harbour, were dressed to commemorate the day, and only necessary work was carried on at the docks. The Harbour Commissioners granted to all of their employees a day's leave with pay and all employees who were required of necessity to work on Coronation Day, were granted a day with pay in lieu thereof at some other time.

An interesting event of Coronation Year will take place in the summer. Their Majesties the King and Queen have graciously consented to visit Belfast on Wednesday, the 28th July, and as they will arrive at Donegall Quay, Belfast, the Harbour Commissioners are to have the honour of receiving them immediately they land. On that occasion the Port will be rich in decorations and it is proposed to erect stands in the shed through which Their Majesties will pass, and a considerable proportion of the available accommodation will be allotted to school children.

Their Majesties also propose to visit the famous shipbuilding works of Messrs. Harland and Wolff, Ltd., which are situated on the Harbour Estate.

SOUTHAMPTON.

The decorations throughout Southampton in celebration of the Coronation were very striking. All the dockland premises and the ships were gaily dressed with flags and bunting, and a particularly attractive design distinguished the main gateway to the new Docks Extension Estate. Southampton Harbour Board offices were tastefully decorated, and were floodlit at night, the illuminations showing up the building very effectively.

A carnival procession, although curtailed by rain, proved a popular feature of the day's events. In the evening there were bonfires on Southampton Common and a firework display which was attended by thousands of spectators.

The three naval vessels that visited Southampton during the Coronation period proved a great attraction with the public. The Greek cruiser "Georgis Averoff" and the British destroyer "Bulldog," were berthed at the new docks extension quays, and the Docks and Marine Manager granted special facilities to visitors desirous of entering the docks to inspect these ships. Another British destroyer, the "Boadicea," anchored off the Royal Pier, and was illuminated at night.

By a happy chance, the R.M.S. "Queen Mary," which had arrived with 1,819 Coronation visitors two days before, was open for public inspection for several days.

Harbour Office, Belfast.

The Coronation

(*continued on page 236*)

Notes of the Month

Shoaling of Entrance to Pomaron, Portugal.

The bar at Villa Real de Santo Antonio having recently restricted the approach to Pomaron, Portugal, dredging operations have been put in hand and it is expected that the position will become normal within the space of about a month.

Port of London Authority.

At the first meeting following the triennial reconstitution of the Port of London Authority, the Rt. Hon. Lord Ritchie of Dundee was re-elected chairman for the fifth successive period. The Rt. Hon. Thos. Wiles, P.C., was again elected vice-chairman.

New Wharf on the Thames.

A new wharf, known as the Horseferry Wharf, has been recently constructed on the site of the old Horseferry dry dock on the Thames and furnished with warehouse accommodation, which provides much-needed storage space for the increasing business of the owners.

Coal Harbour at the Faroe Islands.

A Danish State loan of 200,000 kroner will be extended for the building of a coal harbour on the south side of Trangisvaag Fjord on the Faroe Islands and a further loan of 150,000 kr. will be extended by Danish coal companies. The State loan is to be paid off over a period of twenty years, carrying an interest of 5 per cent. commencing from the date of completion of the harbour.

Port of Churchill Shipments.

Owing to market transactional difficulties, it is stated that the Port of Churchill, in Manitoba, is faced with a closed season in regard to wheat shipments, unless action is taken by Federal and provincial governments. Mr. A. L. Lawes, Vice-President of the Montreal Shipping Co., after a visit to the Hudson Bay port, reports that there are only two freights in store and he doubted if any more wheat would be shipped this season unless the situation is altered. Navigation to and from Churchill opens about August 1st, and the season is very short.

International Inland Harbour Conference.

An International Harbour Conference in connection with the German Inland Harbour Session is to be held in the Hansa town of Cologne on the 24th, 25th and 26th June. The programme commences with a festival opening on the first day, followed by a series of papers, speeches and discussions on a variety of subjects associated with inland water traffic, shipping and harbour affairs. Excursions to neighbouring places of interest have been arranged in connection with the conference, the subscription for membership of which is 3 Rm. Address: Sekretariat der Internationalen Binnenhafen-Konferenz, Unter Feltenhennen, Köln, Germany.

Proposed Yacht Harbour at Southend.

It is stated in the press that a report is soon to be presented to Southend Corporation regarding the provision of a yacht harbour adjacent to the pier head. After a scheme sponsored by the Royal Corinthian Yacht Club to provide a harbour costing £250,000 had been rejected by the Corporation, local yachtsmen investigated the possibilities of providing a smaller harbour near the pier. An Inter-Yacht Club Committee was formed, and it is understood that they have already had the advice of harbour specialists, who report that not only is the scheme practicable, but that it can be carried out at reasonable cost. The Corporation have formed a sub-committee to consider the matter.

Laid-up Shipping.

The Chamber of Shipping quarterly return of the number and tonnage of ships laid up at ports of Great Britain and Ireland on April 1st, 1937, is given below, together with figures for previous quarters.

	No.	Net tons
April 1st, 1936	231	473,892
July 1st, 1936	200	502,219
October 1st, 1936	175	402,935
January 1st, 1937	121	212,435
April 1st, 1937	77	90,345

The return shows a decrease of 122,090 net tons, or 57.5 per cent. as compared with that for January 1st, 1937, and a decrease of 383,547 net tons, or 80.9 per cent. as compared with that for April 1st, 1936.

The ports showing the largest decreases are Newcastle 26,000; Truro 22,000; Dartmouth 13,000; Swansea 13,000; Cork 12,000; Gareloch 9,000; Tollesbury 9,000 net tons.

Congestion in Tyne Ports.

Owing to difficulties arising out of the coal situation, considerable delays during May have been reported in loading at staiths on the River Tyne.

Port of Preston Traffic.

In reviewing at a recent meeting of the Town Council, the activities of the Preston Docks during the past year, Alderman W. Lucas, pointed out that for the second time in its history, the imports and exports had exceeded a million tons. The total of 1,083,735 tons was a record for the port and an increase of 95,000 tons over the previous year, and 83,477 tons more than the anterior record established two years ago.

Cattewater Harbour.

The Cattewater Harbour Commissioners have placed a contract with Messrs. Tilbury Contracting and Dredging Co., Ltd., for the removal of the Carpenter Rock, a limestone formation lying in the Cattewater, Plymouth. It is understood that the work which will necessitate the employment of a Lobniz rock cutter, in addition to the necessary dredging plant, will be put in hand within the next two or three months.

Stapleton Free Port, Staten Island.

The question of the future operation of the New York Foreign Trade Zone located at Stapleton, Staten Island, has still to be decided. The Zone, it will be remembered, was opened on February 1st last. For fire prevention purposes 850,000 sprinklers are now being installed at an additional cost of $100,000. Owing to lack of business the Customs Station has been temporarily withdrawn and official opinion in New York favours the adoption of private operation.

Modernisation of the Port of Gloucester.

Various improvements designed to facilitate the access and manœuvring at Sharpness Docks have recently been in hand at the Port of Gloucester. Under former conditions, while it was possible to dock ships at Sharpness on night tides, it was an operation fraught with some difficulty, and the new lighting installation will enable many more ships to make the port during the hours of darkness. The docks, which were constructed and opened for traffic in 1874, were closed by gates worked by manual power until the 'eighties of last century, when the Dock Company decided to instal hydraulic machinery. This machinery is now being replaced by a more up-to-date installation which includes a pumping system delivering oil under pressure to the gate operating machines, sluices, capstans and coal tip. The pumps are driven by an electric motor. The Sharpness Docks have a water area of 20 acres and a quayage of approximately 12,000 lineal feet.

Oil Harbour Extensions at Copenhagen.

The Copenhagen Harbour Board have under consideration a proposal emanating from the Managing Director for considerable extensions to the oil harbour at Prövestenen. He points out that of the storage area of 30,000 square metres made available by the construction of the breakwater, about 17,500 square metres has already been leased within a year of the breakwater being taken into use. With the object of concentrating in this neighbourhood all traffic ancillary to the existing oil storage depots, negotiations have been opened with prospective tenants, and it has appeared desirable to proceed without delay with the construction of a second breakwater, so as to form a basin. As a result of this and other works a further 60,000 square metres of storage space will become available. The cost of the proposed works is 3,650,000 kr., and authority to spend this amount is sought.

Labour Difficulties in French Ports.

Complaint is made that following recent legislative alterations in working hours, labour conditions in the majority of harbours continues very unsatisfactory. Reports as regards riots and disturbances are not always or even generally reliable, but the speed of the working is undoubtedly inferior to what it was before. At Havre, for instance, it is stated that the average weight of cargo handled per man per hour has fallen from 719 kilogrammes in December, 1935, to 574 kilogrammes in December, 1936, to 560 kilogrammes in January, 1937, and further to 472 kilogrammes in March last. This deterioration is causing serious losses. Furthermore, the number of casualties is increasing in inverse ratio to the quantity of tonnage handled. It is affirmed that even allowing for certain fictitious claims, developed under the prevalent unrest, there remains the fact that the practical transfer from employers to unions of the choice of foremen and of workers, has led to an appreciable increase in the number of accidents.

New Graving Dock at Genoa*

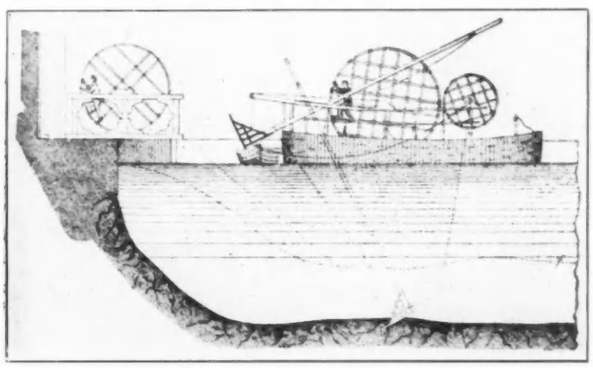
Important Addition to the Port Facilities

By Ing. Dott. ARIBERTO ALBERTAZZI, Director of the Port Works

(Translated from the Italian)

IF the number of repairing or careening basins existing in our harbour is rather limited in comparison with the volume of traffic and number of vessels which have called and continue to call at this Emporium, the history of the construction of these works reveals a certain nobility of character, and in some points an originality not without interest.

The completion of the building of the first Dock of Genoa, which Charles Albert had ordered from the Prince of Carignano, Chief of the Royal Navy, goes back to the year 1851. The site of the dock was in the north-eastern corner of what at the time was the Military Basin, where the natural depth was about three metres, and the borings revealed the existence of a compact mass of marl down to the depth of 14 metres.



A "Carack" of 1850.

The work of excavation was performed by means of "caracks," which were a kind of excavating pontoon with buckets driven by cables, traction being effected by wheels operated by the foot pressure of workmen (not galley slaves, such as those employed at Toulon in similar machines).

Within the excavated zone which, closed to the sea by a caisson full of water and ballasted, produced not water-tightness but quiescent water; the foundation of the dock was laid with concrete poured from five sets of grabs which opening, when in contact with the bottom, deposited their contents thereon, without loss by washing away, the material consisting of about 16,000 cub. metres of concrete made with lime and pozzolana.

The side walls were built by pouring concrete from similar grabs between moulds, consisting of seven caissons with the respective frames appertaining to them. A temporary wall, three metres in thickness, corresponding to the gate of the dock, completed the cofferdam, in such a manner as to make it possible to empty the basin one year after the deposition of the concrete had been completed.

The work was completed within four years, a remarkably short time, considering the facilities available at that period and the suspension of work due to the disturbances of Genoa in 1849.

This oldest Italian dock (length 83 metres, width at mean tide, 21.40 metres) constitutes a most successful first Italian example of such kind of work with deposit under water, repeated subsequently at Naples in 1850, at Messina in 1863, and at Venice (No. 2) in 1878, after an attempt at execution in the dry state had failed, which latter system, however, had succeeded at Leghorn, and with another dock of Venice (No. 1).

When constructional operations, with the aid of compressed air, had become established, the more important undertakings of the kind constructed in Italy and abroad applied this most useful system of working, and during the period from 1888 till 1893 for the two large docks in Genoa at the Grazie, the first application took place of that variation of the method which utilises floating caissons, i.e., caissons equipped with "regulating shafts," suitable for promoting the sinking, raising and fixing at any desired level of the chambers in which is executed the work under compressed air. This type of caisson was used for the floor of the Docks Nos. 1 and 2 at the Grazie, while the side walls of the same and the adjacent quays were constructed by means of caissons suspended on floats, such as were afterwards used during the years 1914-1917 for constructing the largest dock of Venice (No. 3).

With the two docks at the Grazie and that of the Basin, which had become Communal property, and with the help of a 2,700-ton floating dock, installed in the harbour in 1898, and which was transported elsewhere during the European War, the Port of Genoa afforded accommodation for the numerous dockings which introduced into the principal basins from 1893 till 1925 eleven thousand craft, representing a tonnage in round figures of 38 millions.

During the closing years of this period, the activities of admitting vessels to the docks and the several operations on their hulls, reached practically the limits of space available, and the interests of the port demanded fresh docking facilities. When the period of the slump, which followed immediately after the termination of the Great War, had been surmounted, the advent of the "Regime," reviving the vigorous energies of the nation, together with the financial settlement of the affairs of other harbour works, made it possible to place the project of a new dock on a positive basis, and in 1925 the construction of the third great basin was started. Making a bold decision, induced by the lack of suitable space elsewhere, it was inserted between the two docks already existing, the confronting walls of which were made to serve as the sides of an ample cofferdam, the lesser sides being formed by the semi-circular head and the gate, built up by means of caissons, partly of reinforced concrete ("perduti") and partly suspended, which allowed the excavation for the floor and its masonry work, and the construction of the side walls and the other work within the basin to be carried out in the open and at ordinary atmospheric pressure, without interrupting the working activities of basins on either side.

The two basins, Nos. 1 and 2, have maximum useful lengths on the blocks, respectively, of 172 and 212 metres, and widths at mean tide level, respectively, of 24.90 and 28.20 metres, with cill depths, respectively, of 8.50 and 9.50 metres.

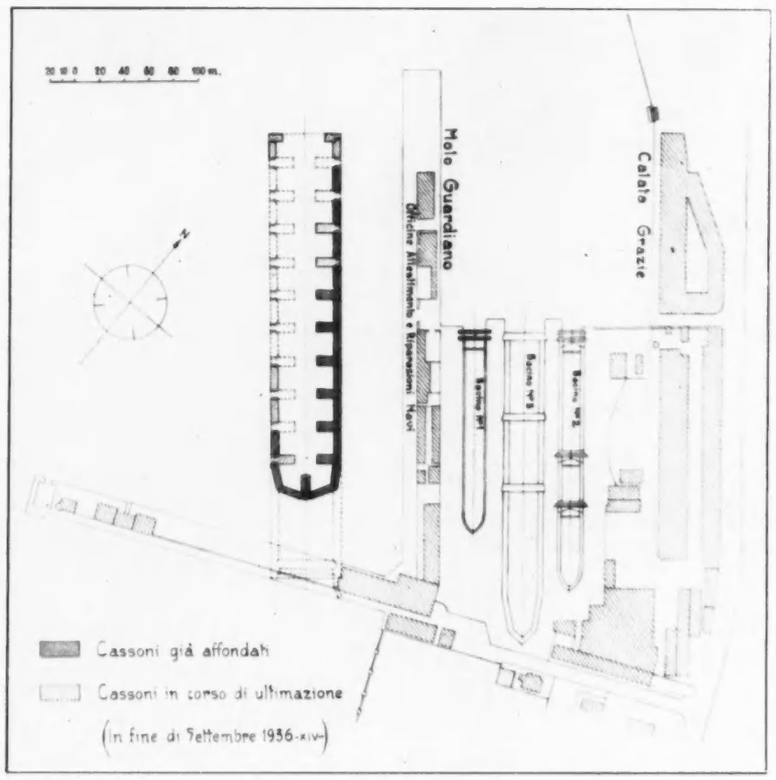
To the third basin, inserted between them, was assigned at first a length of 240 metres, which, together with the width of 32 metres and a cill depth of 12 metres, represented a balanced proportion of dimensions and the desired attainment of docking facilities which, at the time, were absolutely necessary.

* Extracted from the Municipal Review "Genova," and revised to date.

S.S. "Rex" docked in Basin No. 2.

New Graving Dock at Genoa—continued

The third basin was constructed in three years and finished in June, 1928. Its dimensions had been fixed in 1925, when our great liners, which had recently entered into service, such as the "Conte Verdi," the "Conte Rosso" (170 metres), the "Giulio Cesare" and the "Duilio" (183 metres), and those still on the stocks: the "Biancano" and the "Roma" (199 and 215 metres) could be accommodated with reasonable ease in the new basin with its length of 240 metres.



The Four Graving Docks at Genoa.

NOTE—The Caissons already sunk for the new dock are shown hatched.

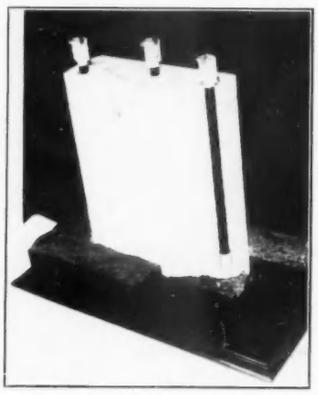
After this work had been completed, however, the laying down of two transatlantic liners was contemplated, having larger dimensions than those of the basin, and thus arose the necessity of having to cope with these new requirements, for which purpose two solutions had to be compared: that is to say, the extension of the length of Basin No. 3 or the construction afresh of a work which should have greater dimensions in accordance with the scheme of the 30th November, 1930, which contemplated the new basin as having the length of 350 metres, and situated in the space included between the Guardiano and the Giano Moles.

Many were the factors which the discussion that arose brought forward for consideration and for decision: nor had all of these a technical character nor direct value as regards the interests of the port. It was decided, however, having in view the very short time now available, to adopt the lengthening of Basin No. 3 by 20 metres, which could be achieved by constructing a new semi-circular head, a work not less difficult than before, requiring a sheltered water enclosure for the submerged caissons, to be inserted by compressed air in the rocky ledge of the Giano Mole. The lengthening work was started in March, 1930, and 16 months later the "Rex" made her entry into the lengthened basin where the side clearances, with regard to the beam of the vessel, measured slightly more than one metre, while the stern projected and overlapped the gate of the dock.

The problem of a form of construction, better suited for the requirements of the present and of the near future, could not fail to crop up again within a short period.

As a matter of fact, it was not the requirements of the Merchant Service alone which intervened in 1934 to bring the question up again, but other considerations, also intimately connected with the National Defence, demonstrated the precarious and transitory nature of the solution of the problem adopted in 1930, and a working scheme (presented on the 30th July, 1934) was considered for another new dock basin also of the length of 350 metres, situated more or less in the previously contemplated position outside the Guardiano Mole, and having an available width between the side walls of 40 metres, with a cill depth of 13 metres. This scheme was investigated by the High Council of Public Works, and it was approved in November, 1934.

The position of this dock was fixed parallel to the aforesaid Guardiano Mole, leaving between it and the nearest side wall a free space of 50 metres, which will still allow the use of the quay for the purpose of the equipping and repairing of vessels. This position allows of the formation of two independent entrances to the dock, an arrangement which is of evident utility for working purposes and which is realised practically by the arrangement of three intermediate recesses (besides the double end-recesses) which enable the dock to be divided into sections according to the varying requirements for docking smaller craft. Northwards, i.e., towards the old harbour, the free space for entrance manœuvres will be over 450 metres, a size allowing of the turning of



Model of a Side Longitudinal Caisson.

the largest vessels which the dock can accommodate, while towards the Duca degli Abruzzi Dock a vessel will be able to manœuvre within a space which admits of her entering by the subsidiary entrance (a passage to be cut through the Giano Mole) even if her dimensions may be rather greater than those of the majority of ordinary large steamers, which may be taken to be about 120 metres.

The time available for meeting punctually the immediate docking requirements of high national interest, leads us to carry out for the present only the first stretch of dock for the length of 280 metres, postponing to a later date its extension and the second entrance towards the East.

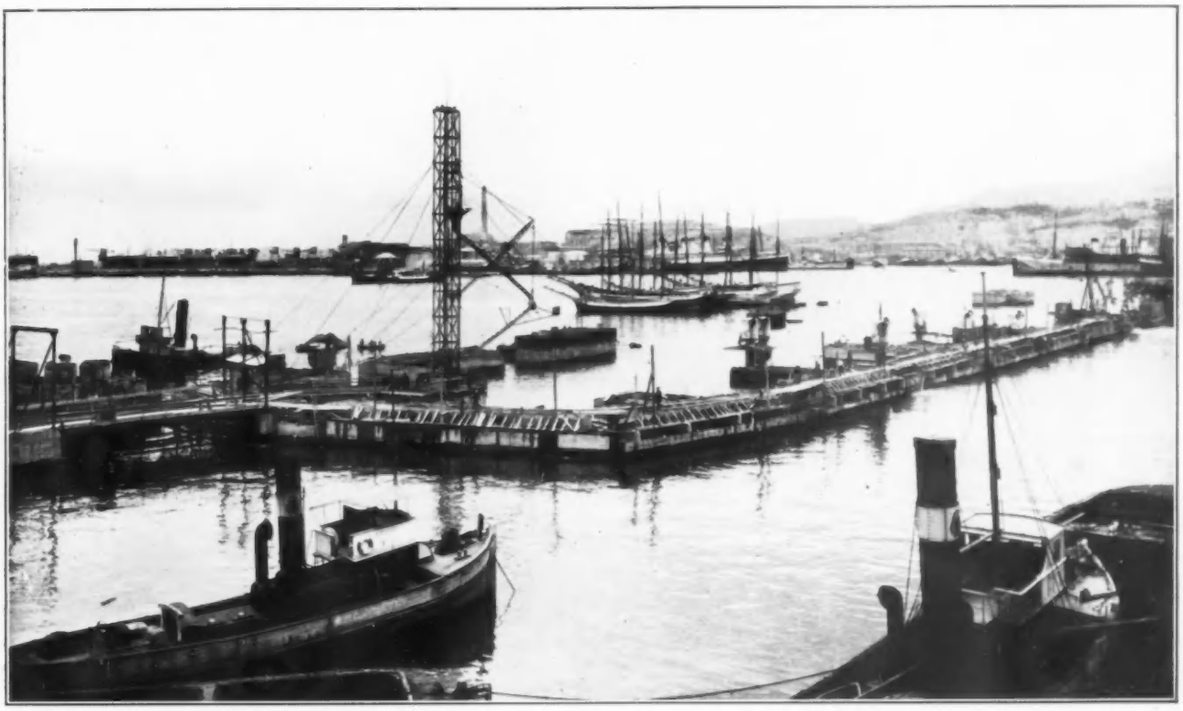
The plan and the photograph of the model of the dock which are reproduced here give a general idea of this new installation and the situation with regard to the pre-existing works.

The system designed and adopted for the construction of the new docking and repairing basin possesses distinguishing features which are attributable, both to the nature of the foundation on which it rests as well as to the idea, already tried in Dock No. 3, of constructing at first by means of the side walls a quiescent water enclosure, and then carrying out excavations in the rock foundation, the masonry work of the latter and the other interior work, in the open and under atmospheric pressure.

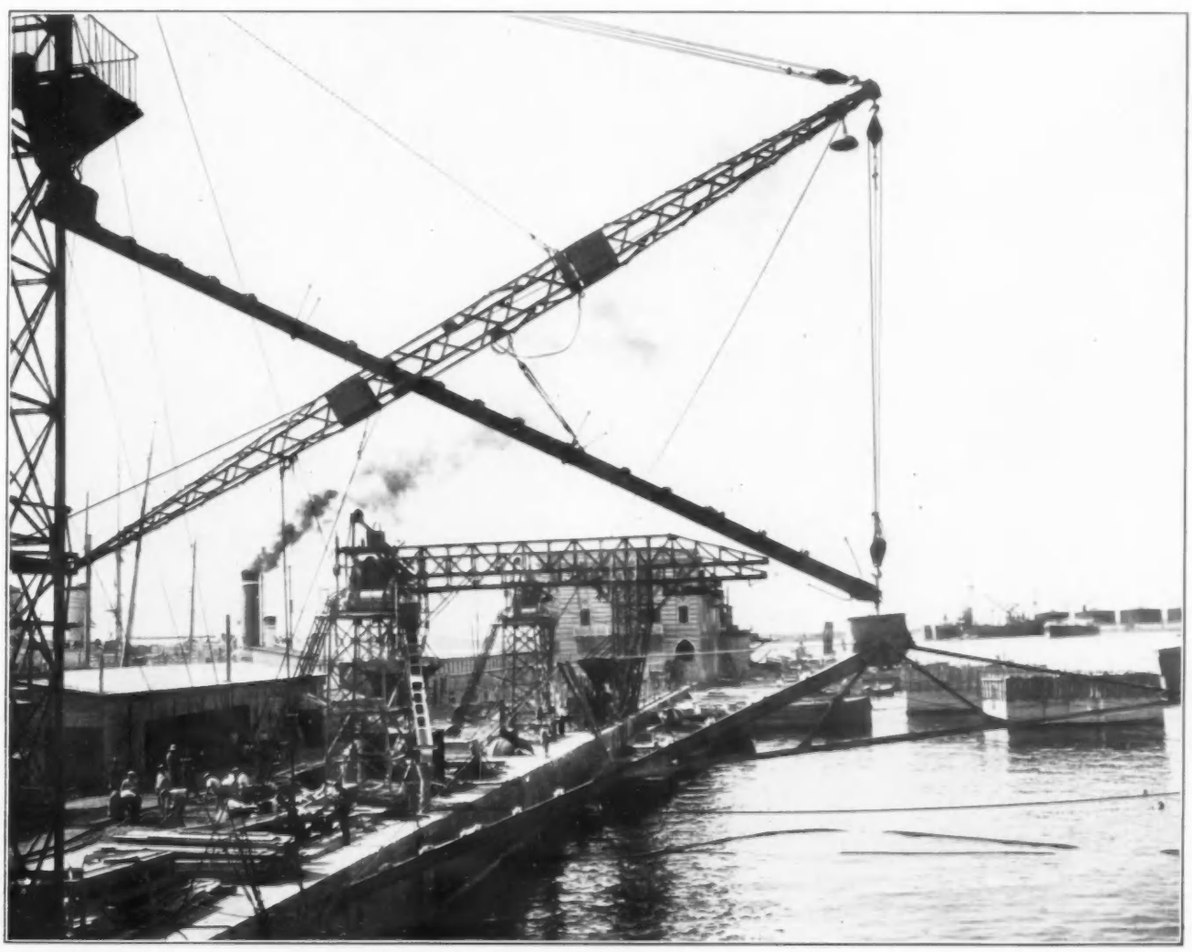
The zone of the floor or working area had therefore to be liberated from the under-pressure of the internal water, i.e., the floor must be adapted to drainage, and the possible and limited infiltrations of water must be collected in underground culverts and then evacuated by pumps while work is being carried out in the dock. This arrangement makes it possible to reduce the thickness of the floor, which in the present case is contemplated to be four metres, while in cases of basins in which, on account of the nature of the foundation, as well as on account of the corresponding system of construction the work is subjected to the entire under-pressure, it is necessary to give a thickness of from 12 to 15 metres to the floor for a width of basin of 40 metres.

In order to carry out and realise the objectives mentioned, it is necessary to insert the perimeter of the side walls and the end wall (which forms—for the present—the semi-circular head) as well as also the entrance cill into the most compact and sound strata of the bottom rock, i.e., into the Eocene limestone which constitutes an important portion of the general rock structure of this region, and which is found in outcrops with fractures and interpositions of calcite and clay, for which reason it is necessary to remove the superficial strata and sink the caissons deeper by some metres into the superficial rocky bottom

New Graving Dock at Genoa



Set of Caissons in position.



Caissons afloat alongside Moulding Yard.

New Graving Dock at Genoa—continued

before finding a suitable and more secure base for constituting a really hermetic diaphragm owing to the conspicuous difference of pressure between the outside and the inside of the basin when it will be emptied. In some of the caissons already sunk, indeed, it has been found necessary to sink the general excavation for the support of the caisson down to 23 metres and the under-excavation down to 26 metres below sea level.

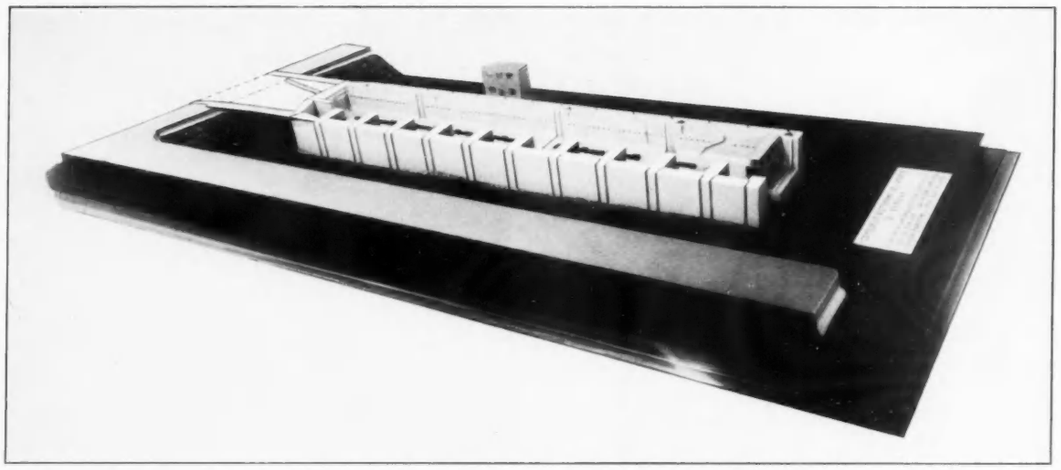
The operation was carried out by means of submerged caissons of reinforced concrete, huge rectangular blocks (with the exception of the end ones) about 20 metres long, 6.20 metres wide, and from 20 to 25 metres high, in the lower portion of which there is the "working chamber," i.e., the compartment of compressed air which occupies a height of just a little over two metres; the remaining space, i.e., the space above the ceiling of the working chamber, is divided by vertical partitions which serve to stiffen the structure.

The entity of the side walls and semi-circle for the 280 metres length of the dock, is constituted by 47 caissons alternately arranged, in relation to the side walls, longitudinally and transversally, these latter having the function of acting as counterforts and stiffeners for completing the stability of the side walls, which would not be sufficient with only the thickness corresponding to the longitudinal caissons (6.20 metres) to withstand the thrust of the water, although morticed into the bottom rock, when the basin of the dock will have to be emptied.

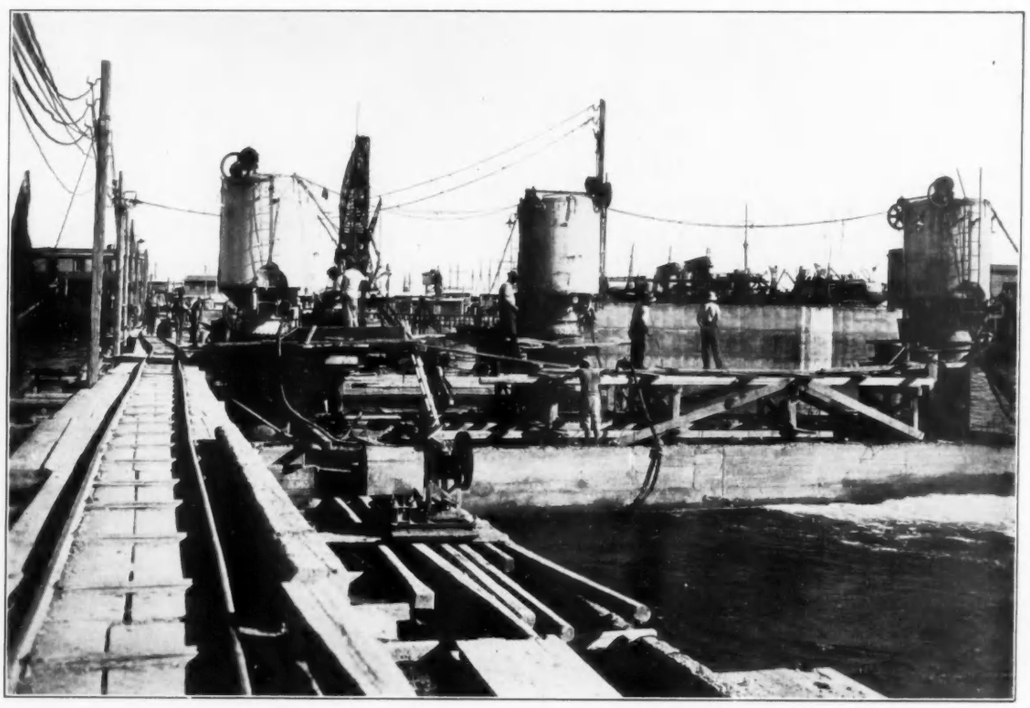
The interior of each longitudinal caisson is divided into cells in such a manner that they shall constitute horizontal arches between one stiffener and the next; therefore, after having arranged two successive stiffeners and one longitudinal caisson, the construction of the horizontal arches is proceeded with and the latter are continued also in the interspacial joint between the longitudinal caisson and the stiffening caissons. This work also is carried out under compressed air, the side walls of the joints being closed by water-tight partitions and then the work of excavation carried out down to the compact and impermeable rock.

The remaining portion of the cells of the longitudinal caissons is filled up with cement and pozzolana concrete. The vertical panels of the outside sluice are housed into the cellular caissons, and the horizontal panel is constructed by means of a movable caisson with compressed air. After the interior of the dock is emptied, the thickness of the side walls will be increased to nine metres, which is the thickness prescribed and calculated for the finished work, and as the strengthening caissons project into the interior of the basin, the projecting portions will be demolished.

The first set of caissons, of the height of 11.50 metres, including the immersed working chamber, has been constructed of reinforced concrete, with internal dimensions of 22 by 7 metres (at the site at Canzio Wharf in the Victor Emmanuel III. Dock) whence they have been floated into the work yard and raised to the necessary height in order that when placing them in the position which they will henceforth definitely occupy, the interior cells may not be invaded by water. Being then brought over the said position, they are gradually sunk until they settle on temporary levelled platforms, carried out partly in rock and partly on a mound of loose stones, with the



Model of Basin No. 4.



Caissons in situ.

New Graving Dock at Genoa—continued

help of a diver or by means of a small caisson worked by compressed air. From this point begins the work under compressed air, in the chamber previously arranged for this purpose in the cellular caissons, for the subsequent sinking until the compact and impermeable rock is reached throughout the floor area. Below the supporting area of the cellular caissons, one or more water-tight diaphragms are made by excavation in the rock and subsequent filling up with cement concrete having a high percentage of cement.

When the excavating work under compressed air has been completed for each caisson, the working chamber also will be filled up with cement concrete and, in order to ensure impenetrability and the absolutely perfect adherence of the concrete to the walls of the working chamber and to the rock underneath and at the sides, injections are made under high pressure with cement mortar.

* * * *

At the date (February, 1937) at which this article is prepared for press, 34 caissons have been sunk in their permanent position and filled, of which 21 are longitudinal and 13 are transversal. There are 14 other caissons in course of construction. The side of the dock towards the East (i.e., towards the Guardiano Mole) has been completed; the other side is well advanced.

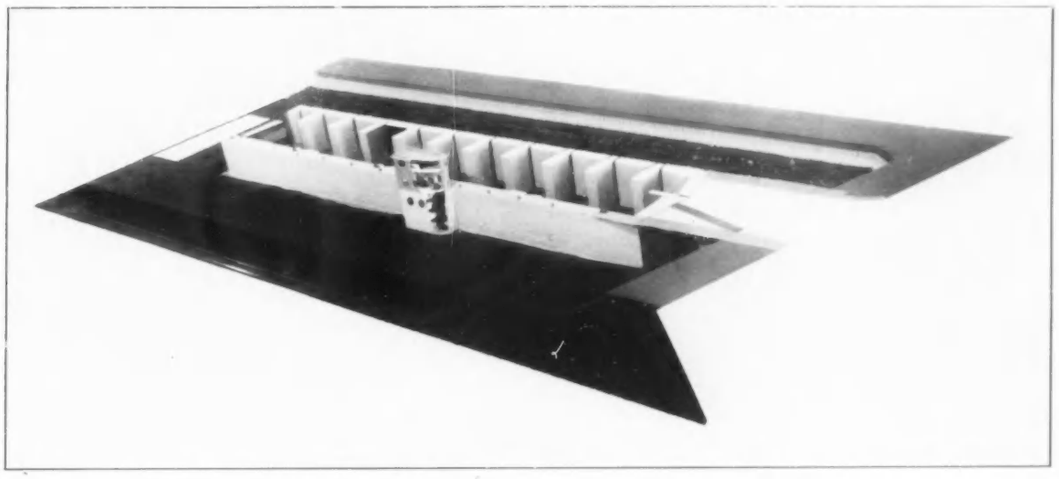
The work is going forward with great speed. In the work yard of the Giano Mole there are in operation three air compressors, of the combined power of 360 h.p., for the caissons, 19 diving bells for compressed air, five concrete mixers, three hoists for the aggregate, etc. Furthermore, extensive installations for the transport of raw materials and of concrete; pontoons, derricks, sheers, pumps and several craft provide a convenient circulation of materials and of men linking up what is prepared in the immersed moulds stationed at the site of the Canzio Wharf (where the floating caissons are made up) with what is completed and put into place on the site of the works in hand. The time for carrying out all this is strictly limited: it is desired to afford docking possibilities before the end of 1938; and since the orders to the undertaking date from the end of February, 1935, there is a little over three years in which it is essential to complete the work, in spite of the remarkable depths reached and of the notable difficulties under which the transport of supplies of materials—especially of metals—is being conducted.

Now, as we have considered the portion of the undertaking which has been carried out up to the present, we proceed to give an idea of the dock as it will appear when completed, by a concise description of it.

The basin, as can also be seen from the photograph of the model, for the first period, will remain isolated in the water area allotted: for communication with the Giano Mole a gangway has been constructed, which at an intermediate point rests on a special reinforced concrete caisson filled with sand and gravel, so that when the dock will have to be prolonged (or lengthened), by removing this loose material, the small caisson will be floated again, and the work of demolition and clearance will be rapid and economical.

An essential feature of the dock is the pumping installation. In view of the position and the compactness of the undertaking, the idea of inserting the pumping plant in the side of the dock itself, an idea adopted in No. 3 for imperative reasons of space, was abandoned. Here it is possible, and definitely suitable from several points of view, to instal a separate power station for the discharge at the side of the basin. The Pump House will be floated on to the site, of course, still without its machinery. It will be one of the immersible caissons which, at present, are used at the Canzio Wharf to make the side wall caissons, and which when this its mission has been accomplished, will be lightened of its ballast, which at present keeps it fixed to the sea bed, and it will be towed alongside the series of caissons and built in to them, forming unbroken contact with them.

This caisson, the plan dimensions of which are 24.80 by 10.50 metres, will be equipped with several horizontal partitions so as to constitute, towards the bottom, the receptacle for the three great centrifugal pumps—the casings of the vertical axis propellers—placed at 14 metres below the level of the sea, as well as, also, the bodies of the lesser drainage pumps; above that level there will be arranged the large discharge tubes, curved siphonwise and discharging a few decimetres below the outside water level. The spindles of the pumps will be connected to the shafts of the motors, the floor of which will be above sea level, in a space, therefore, where good lighting and ventilation conditions are enjoyed; above this, the transformers and their numerous accessories will be installed.



Lateral View of a Model of the Basin showing the Pump House.

In regard to the problem of extracting from the completed chamber of the dock, the whole of the 180,000 cubic metres of water it contains within 3½ hours, while overcoming variable heads between zero and about 15 metres or so, the limits are such as to indicate, especially to experts, what difficulties have to be overcome, in order to obtain proper working and a good output.

The machinery is in an advanced stage of construction:—Three main groups of vertical helicoidal shaft pumps with spiral distributor, 415 revolutions per minute; engine power: 1,100 h.p.; pump delivery: 16,500 cub. metres per hour. Three groups of drainage pumps with an hourly delivery of 280 litres per second, 125 h.p. engines at 1,450 revolutions per minute. The working voltage will be 1,000 volts; the transformers will have a capacity of 1,000 K.V.A. each.

For working the six sluice paddles of the great culverts of the dock, which have diameters respectively of 2 and 3 metres, hydraulic machines are employed (besides the emergency hand apparatus), the liquid of which (oil) works at a pressure of 70 atmospheres.

All the machinery is entirely and exclusively of Italian manufacture.

The flooding of the dock has its own requirements also, and its own importance for the purpose of the working. It has to be rapid; having regard, nevertheless, to the effects of currents and of the variation of the stresses generated by the operation; moreover, it must be possible to interrupt and to regulate it, thereby assisting the operations of docking and the work of the caulkers, painters, etc.

In Dock No. 4, besides the ordinary flooding method adopted through the sluice-valves of the caisson gates, the water can be admitted through the outflow pipes of the main pumps, and accordingly, through the discharge culverts, i.e., by reversing the pumping cycle. For this purpose, if necessary, a pump closure device is contemplated in addition to a pneumatic suction valve at the vertical elbow of the piping, in order to prime the siphons and for the manœuvres therewith connected. With this assistance, it is calculated that greater rapidity will be obtainable during the flooding periods, as also a more uniform distribution of the liquid flow into the basin.

The dock will be served by two caisson gates. One of these constructed simultaneously with the masonry work, will complete the water-tight enclosure, which will allow the emptying of the basin even before the construction of the floor, of the

New Graving Dock at Genoa—continued

No. 4 Graving Dock. General View of the undertaking and its environment. February, 1937. Note: the Dock is in the left foreground.

execution in mass work of the side walls, and of the subsidiary operations. The other gate will be a reserve or spare gate, subdividing the basin for minor admittances. The caisson gate type of closing is the one adopted in all Italian docks, and it is distinguished by the features of simplicity and working elasticity, needing but slight space requirements and a relative facility of up-keep. The gates for Dock No. 4 will have to bear and transmit to their surfaces of support (quoins and cill) the pressure of 150 tons per linear metre. They will bear on the granite at their periphery through a frame of timber immune from marine organisms, with hemp packing. They will be provided with sluice-valves for the filling of the basin, which can be operated either by hand or by electric motors fed by the same current which feeds the other auxiliary services at a voltage of 220 volts. Special arrangements contribute to render harmless to the masonry work and the craft admitted, the jets of no negligible importance, due to two cascades of water which fall, at first, from a height of about a dozen metres.

On the floor of the dock and arranged with a transverse slope of 1.5 per cent., the vessels will rest on three rows of blocks of selected Sardinian holm-oak.

The consideration of the distribution and arrangement of the blocks must depend upon manifold requirements: the distribution of such enormous loads as those of a great ocean liner in such a manner as not to cause strains and deformations either in the walls of the dock or to the structures of the vessel; on the other hand, the limitation of the encumbrance caused by the supports in order to allow surveys to be made of the keels and the necessary work thereon, the necessity of arranging things in such a large dock so as to be able to shore up even smaller vessels, the sides of which remain at a considerable distance from the sides of the dock, the convenience of being able to careen two smaller vessels alongside in the same section of the dock, and again, in the case of larger hulls, the necessity of supporting them not only along the keel but also under the sides, in the curves, that is to say, along the lines of the bilge keels—all these points constituting so many problems not always according with the means and the aims in view which, in different docks in all countries lead to different and divergent solutions. In the search for the best satisfaction of all the exigencies, it is not surprising that such a study should last until but a few months before the date of completion of the undertaking, as that important issue is one of the last to be acted upon.

The great dock will be completed by that series of accessories which the docking and repairing industry always tends to increase . Capstans and hauling gear, blocks and tackle, rings, ladders, slides, fresh water and salt water pipes, compressed air pipes, electric wiring, current plugs for hoisting and conveying appliances, tele-indicators of level for the several sections of the dock, telephones and signalling appliances for manœuvring controls; then sanitary services, workshops for appliances, paint and other various materials, offices, fire-fighting and anti-aircraft devices, shelters for the staff, workshops, etc.

It is proposed to equip the basin with four electric cranes, one of which will have a capacity of 15 and the other of 30 tons, with an outreach exceeding the central axis of the basin.

The cost of the complete basin is estimated at approximately 50 million lire.

* * * *

As already stated, the executive scheme of this undertaking was presented on the 30th July, 1934; the authorisations on the part of the local consulting bodies and the financial provisions, followed without delay. An unexpected hold-up in the subsequent investigations and the necessary steps to be taken to let it out on contract caused the very first workyard installations to be started only in March of last year, while the time-limit, at which it is desired to begin the working of the dock, is adhered to with justifiable insistence.

In order to complete the undertaking within the time remaining available, the carefully-considered programme of the Board of Management of the Works and the contractors does not permit of the least relaxation; on the other hand, the extreme delicacy and the essential importance of the success of the undertaking, while it calls for rapidity and energy, must exclude haste.

We are working, therefore, continuously, without relaxation, but unhurriedly.

Facilities for Coastal Trade at Ports in England, Wales and Scotland

Second Section of the Report by Messrs. WILTON & BELL, MM.Inst.C.E.

(continued from page 195)

English and Welsh Ports up to a 14-ft. Draught on Spring Tides and a 10-ft. Draught on Neap Tides.

(14) Reverting to the list "E" of ports which are not up to a 14-ft. draught standard on both spring and neap tides, it will be seen by comparison with list "F" that the following are above the 14-ft. spring and 10-ft. neap tide standard:—

Whitby	Ilfracombe
Keadby	Lydney
Wisbech	Chepstow
Folkestone	Neath
Littlehampton	Burry Port
Exmouth	Caernarvon
Teignmouth	Port Dinorwic
Brixham	Amlweh
Dartmouth	Mostyn
St. Ives	Widnes
Padstow	

It will be noted from the "Key Plan" that there are not many stretches of coastline of any considerable extent without a port capable of taking a 14-ft. draught vessel, even on neap tides.

Bearing in mind the capacity of motor vessels of 10-ft. draught, it appears that improvements up to a 14-ft. draught standard on all tides would not be generally justified at these ports if the improvements involved any considerable cost.

Dealing with these seriatim, the following observations are made, based on the several memoranda prepared by us:—

(a) **Whitby.**—The depths over the flats off the entrance are given as 16-ft. at H.W.S.T. corresponding to 12-ft. 6-in. at H.W.N.T. The town is a small one, now mainly a pleasure resort, readily accessible by road and rail from Middlesborough and Stockton, and it is not likely that expenditure in attempting to bring it up to a 14-ft. neap standard would give an adequate return.

(d) **Keadby.**—As Keadby is near to the big Iron and Steel area of Scunthorpe, and there are tidal wharves there capable of taking 14-ft. draught vessels at neaps, the possibility of improving the navigation to a 14-ft. draught at all tides standard deserves consideration. When we visited this place, we were informed that the draught was limited to 15-ft. on neap tides owing to shoal places on the River Trent below Keadby, although there is a wharf at Keadby belonging to the Frodingham Iron Mines which, is is stated, has about 20-ft. depth at high water of neap tides.

(c) **Wisbech.**—The draught of vessels which can now get to Wisbech is put at 14-ft. at springs and 10-ft. at neaps, apart from any question of depths at the tidal wharves. There is a considerable length of channel below Wisbech which would require deepening.

(d) **Folkestone.**—Apart from the Pier where the Southern Railway Company deals with passenger traffic, the main working quay, which is tidal, has depths of approximately 16-ft. 6-in. at H.W.S.T. and 11-ft. 6-in. at H.W.N.T. available for other work when not used by the Railway Company's cargo vessels.

The Inner Harbour, which is also tidal, gives 2-ft. less depth at the quays. Any deepening at this Inner Harbour, we were informed, would involve re-construction of the walls, and it is hardly likely to be expected that a railway company would do this, more especially as the tendency might be to divert traffic from the railway.

(e) **Littlehampton.**—The limits for draught of ships were given to us as 16-ft. on spring tides and 12-ft. 6-in. on neap tides. The bar or shoal outside the harbour is the limiting factor. The trade is not large, and the Harbour Commissioners have to face the fact that a reinforced concrete wharf constructed by them at a cost, it is stated, of £6,000 has collapsed, so that they would not be likely to embark on navigational improvements. Otherwise, as there is the catchment area of the River Arun available for scouring, the improvement of this port to a 14-ft. standard might be considered. There is a considerable range of private tidal wharves, and there are buildings which could be readily available for warehousing purposes.

(f) **Exmouth.**—Though there are quays in the wet dock which, it is stated, could take vessels of 17-ft. to 18-ft. draught at springs, the entrance is shown as giving a depth of only 16-ft. above the sill at H.W.O.S.T., which would preclude a vessel of 14-ft. entering at neaps. The possibility of bringing this port to a 14-ft. standard and improving the entrance and of working it as a tidal dock might be considered.

(g) **Teignmouth.**—The quays are tidal, and vessels of 14-ft. draught come alongside on a medium tide, and there is always 11-ft. at high water neaps. Greater draughts could not be brought in without deepening the entrance to the harbour, which is a passage over sand flats. Apart from the cost of deepening, local opinion would be adverse, as it is considered, in view of past experience, that attempts at deepening the entrance would lay the town open to inroads of the sea.

(h) **Brixham.**—Any possible result of bringing the quays at this port to a 14-ft. standard would not at all likely be commensurate with the cost.

(j) **Dartmouth.**—This town is small, there are big depths in the harbour, but the quay controlled by the Commissioners, which is tidal, has only a narrow space between it and the public road, and the depth of water near to this is poor.

On the opposite shore at Kingswear there is a depth of 15-ft. to 16-ft. at low water, alongside an up-to-date wharf, which is owned by the Great Western Railway. It has not got road access, but is designed for working by rail and is linked up to that system.

To bring the quays at the Dartmouth side up to a 14-ft. standard for all tides would involve considerable expense.

(k) **St. Ives.**—Extensive work would be required to bring this tidal harbour up to a 14-ft. all-tides standard. There are sand deposits in it, and even at the entrance the depths are below the 14-ft. standard.

(l) **Padstow.**—In order to bring quays for the coastal trade in the tidal harbour to a 14-ft. all-tides basis, deepening and probable re-construction of quayage would be required. The port is, we understand, indebted to the Southern Railway Company in order to meet expenses. The main interest is the fishing industry, for which the Southern Railway Company caters.

(m) **Ilfracombe.**—At present, the accommodation for coastwise trade is very poor, except for the pleasure steamers which land passengers at the Outer Harbour landing. The entrance to the Inner Harbour, which is also tidal, is so placed that a bad run exists in this harbour when a swell sets in. If there were alterations made to this in order to remedy this fault, consideration might be given to the possibility of bringing at least one berth in the harbour to a 14-ft. all-tides standard as the town is a progressive one.

(n) **Lydney.**—This is a railway-owned wet dock. The entrance is 33-ft. in width, and there is 24-ft. on the sill at spring tides and 12-ft. at neaps. To provide for vessels of up to 14-ft. draught on neaps would involve not only deepening but widening the entrance. This would then only admit vessels to the tidal basin, and access to the main part of the dock for this draught would involve re-construction of the present lock, which is only 24-ft. in width. Trade is practically confined to shipping coal from the Forest of Dean coalfield and some trade of a tinplate firm. There are sandbanks in the approaches, which have been higher than the entrance cill, so that it is not likely that alterations to a 14-ft. standard would be undertaken.

(o) **Chepstow.**—The former deep water tidal berths are silted. When shipbuilding was carried on here, vessels were brought alongside for completion. We were informed that then there was trouble in holding boats alongside. There does not seem likelihood of the wharves again coming into use.

(p) **Neath.**—The harbour is up to a 14-ft. spring and neap tide standard as at Briton Ferry Dock. Some of the tidal wharves in the river are nearly up to this standard. They are privately owned, the Harbour Commissioners controlling and being responsible for the maintenance of depths in the river and its approaches. Deepening of the private wharves would possibly be justified by facilitating the coastal trade, which here is specialised mainly in the coal and iron and copper trade.

(q) **Burry Port.**—This has a wet dock with a single pair of gates at the entrance. The depth on the cill is given by the Great Western Railway Company, which owns this dock, as 21-ft. at H.W.O.S.T. and 14-ft. at neaps. It is only a small dock, and if freer access were desired, tidal berths adjoining the dock would have advantages.

(r) **Caernarvon.**—The tidal basin is below the 14-ft. all-tides standard, and is liable to silting. Greater depths could be obtained by constructing wharves fronting on the Menai Straits, but any considerable expenditure on obtaining greater depths would probably be beyond the financial resources of this port, which has no industries of moment to depend on. It is useful as a distributive centre for the surrounding districts.

Facilities for Coastal Trade at British Ports—continued

(s) **Port Dinorwic.**—This port is privately owned, and there are a wet dock and tidal wharves.

The depths in the wet dock and the tidal basin are given as 16-ft. at springs, which would give about 13-ft. at neaps. To carry greater draughts into the wet dock would involve reconstruction of the entrance lock.

Alternatively, the tidal wharves might be deepened, but present depths appear sufficient for the specialised trade of this port, which consists of the shipment of slates.

(t) **Anlwch.**—This port was constructed to give accommodation for shipping copper ores from local copper mines now disused. It is practically hewn out of solid rock, is tidal, and as there is practically no trade, any idea of improvements may be ruled out.

(u) **Mostyn.**—The distance from the deep-water channel of the Dee is about one thousand five-hundred yards. The depths at the quays, which are tidal, are not up to a 14-ft. neap-tide standard.

Aerial View of Ramsgate.

There are sluicing reservoirs available for maintaining depths, but to bring this port to a 14-ft. neap tide draught standard would probably involve auxiliary works of some extent. In view, however, of the fact that it is of considerable importance, and is operated by the Darwen and Mostyn Iron Company, Limited, for their own works, as well as for other trades, consideration might be given to the question whether deepening would give a commensurate return.

(v) **Widnes.**—Widnes West Bank Dock, which is a wet dock entered by a lock, has 15-ft. on the cill at H.W.O.N.T., so would be able to pass a vessel of 14-ft. draught in at high-water neaps. The depths in the River Mersey lower down would not, however, allow a vessel of this draught to get up or down at neap tides. If trade warranted the expenditure, improvements could no doubt be made in the Upper Mersey with benefit to the coastal trade by allowing heavier draught vessels to work up the river on neap tides.

English and Welsh Ports up to a 14-ft. Draught on all Tides

(15) In S 3, we referred to the obvious desirability of a port having such depths that coasters of considerable draught could proceed to and from their berths at any state of the tide.

Amongst the ports in lists "A" and "C" there are sixty-five ports which could take vessels up to 14-ft. draught at H.W.O.N.T., but of those only a limited number could admit such vessels to a berth at any state of the tide, and the cost of alterations to bring all others to such a standard most certainly could not be justified. There might, however, be justification for improvements in a limited number.

To enable a judgment to be formed, we append brief notes on these ports, extracted from the memoranda we prepared on them:—

(a) **Berwick-on-Tweed.**—There is only about 3-ft. depth on the bar at low tides. There is a wet dock with a single pair of gates giving good quayage for coastal trade, but the single gates restrict movement. Improvements might be made by remodelling tidal berths in lieu of installing a lock entrance, but 14-ft. draught vessels obviously could not enter or leave the port except during a limited tidal period, owing to the lack of deep water at the entrance.

(b) **Warkworth.**—This is a port devoted almost exclusively to shipping coal from the Broomhill Colliery. The depths at the staithes, which are tidal berths, are 10-ft. at L.W.O.S.T., which is deeper than the entrance bar. The latter is kept to a depth of 6-ft. at L.W.O.S.T. by dredging. This depth would allow a 14-ft. draught boat to get to and from a berth over a considerable part of a spring tide and of some hours of a neap tide. The Broomhill Colliers, taking 2,500 tons of coal on from 16-ft. to 16-ft. 6-in. draught, get to sea on a neap tide.

(c) **Blyth.**—The navigable channel has a depth of 24-ft. at L.W.O.S.T. All berths are tidal, and the depths at the staithes have a minimum of 21-ft. at L.W.O.S.T., so that there is absolute freedom of movement for coasters. Coal shipment is the mainstay of this port, and the figures for the year preceding our inspection showed that out of a total of 4,570,487 tons of large and small coal and coke, 2,912,170 tons were coastwise trade.

Depths at berths used for trade other than coal varied from 17-ft. to 21-ft. at L.W.O.S.T., so that this port is superior to a 14-ft. standard draught at any state of the tide.

(d) **Newcastle-on-Tyne.**—At this large ocean port all depths of the waterway are more than adequate for a 14-ft. draught coaster. Besides a large number of private tidal wharves, the Corporation of Newcastle, the Tyne Improvement Commission and the London and North-Eastern Railway Company own quays and wharves. Of general coasting trade, there is a large amount carried on at the Corporation's quays, which are tidal. Depths there vary from 14-ft. to 25-ft. at L.W.O.S.T., so that there is freedom of movement at all states of the tide.

Access to the Tyne Commission's Northumberland Dock, which is a wet dock, where there are very extensive coal shipping arrangements, is restricted by the fact that the lock entrance has only 9-ft. depth at its centre at L.W.O.S.T. and 5-ft. less depth at the sides, high water of a neap tide giving 10-ft. greater depth.

Albert Edward Dock has a lock entrance capable of locking in ocean-going vessels, and having 15-ft. depth on its inner cill even at L.W.O.S.T.

There are also tidal coal shipping berths between these docks, which have depths alongside of from 24-ft. to 30-ft. at L.W.O.S.T.

The London and North-Eastern Railway Company's Tyne Dock, a wet dock, which is stated to have shipped more coal than any other dock in the world, the total being over 300 million tons, can take large ocean-going vessels. From the coastal point of view, the fact that the main working entrance 70-ft. in width with a depth of over 19-ft. at L.W.O.S.T. is not a lock entrance would be a drawback to general cargo trade, though there is a 60-ft. wide lock with 10-ft. 9-in. depth at the centre of cill but less at the sides. So far as coastwise trade is concerned, this, however, is of less importance, as the trade consists almost entirely of coal shipments. About 30 per cent. of the coal shipment from this dock is coastwise.

(e) **Sunderland.**—The entrance to the harbour and in the river up to the first bridge is more than sufficient at L.W.O.S.T. for 14-ft. draught. At the system of wet docks, North and South Hudson and Hendon Docks, entrance is through a half-tide dock, with 30-ft. on the cill at H.W.O.S.T., corresponding to 15-ft. 6-in. at L.W.O.S.T. Within this, the levels of the cills of any passages would allow free movement above this draught.

There is an excellent development in the form of a length of tidal deep-water wharf 1,062-ft. in length, which was being constructed when we visited the port. This will have a depth alongside of 30-ft. at L.W.O.S.T., and the accommodation for dealing with goods is of a novel type. We shall refer to this in a later part of our report, where we deal with the accommodation for goods at the various ports. There are also many

Facilities for Coastal Trade at British Ports—continued

tidal wharves and coal-shipping staithes on the river, to which a coaster of 14-ft. draught could get at L.W.O.S.T.

Of the total shipment of coal, slightly over four million tons in 1932 (of which about 1,840,000 tons was coastwise) about half was loaded at the tidal berths and half in the docks.

(f) **Seaham.**—This port is practically wholly a coal-exporting port, sending in 1932 approximately 1,384,000 tons coastwise. Coal shipment takes place in a wet dock with a simple gate entrance and not a lock. Movement of coasters must therefore be restricted. Whilst there is 16¼-ft. on the cill at M.L.W.O.N.T. at L.W.O.S.T., there is only 11½-ft. Apart from the fact that any lowering of the water level in the dock is restricted by the draught of larger vessels in the dock, the possibility of a vessel of 14-ft. draught getting in and out from this dock is further restricted by the approaches. So far as possible, the depths over the flats at the entrance is kept at a level not shallower than 3-ft. above dock cill, and in the shallowest part of the channel 4-ft. above dock cill. The latter would therefore only give a little over 15-ft. depth at half tide.

(g) **Hartlepool.**—The depth over the flats off the entrance is only about 15-ft. to 16-ft. at L.W.O.S.T., which is insufficient to allow the passage of the larger coasting colliers at L.W.

Widnes West Bank Dock.

The Old Harbour and Victoria Dock, which are both tidal, and the wet dock system, entered by the North Basin, are owned by the London and North-Eastern Railway Company. As the depths in Victoria Dock and the Old Harbour are 36-ft. and 39-ft. at H.W.O.S.T., giving about 21-ft. and 24-ft. at L.W.O.S.T., coasters can get to and from these berths at any time. Movement to and from the wet dock system is restricted, we were informed, to three hours before H.W. and one hour after H.W. If the North Basin were used as a lock, a 14-ft. draught coaster would have a much longer period during which it could enter or leave the wet dock system.

(h) **Middlesborough and Stockton-on-Tees.**—The depth at the bar is 24-ft. at L.W.O.S.T., and even at Dock Point at the London and North-Eastern Railway Company's dock at Middlesborough, it is 18-ft. Even as far up as the reach above the Transporter Bridge there is a wharf with 14-ft. of water alongside at L.W.O.S.T. for part of its length, and in the Billingham Reach above that there is a wharf with 12-ft. 6-in. alongside at L.W.O.S.T. The tidal range on spring tides is about 17-ft., and there are many tidal wharves with a 6-ft. to 7-ft. and upwards at L.W.O.S.T. It will be seen, therefore, that even without improvement to a 14-ft. draught standard at all states of the tide, there is good accommodation for coasters.

The London and North-Eastern Railway Company's wet dock, which is extensive and now very well equipped with modern cranes, is used by large ocean-going vessels, but there is a good deal of transhipment to and from coasters. Their movements are restricted by the fact that, though the 80-ft. entrance has two pair of gates they are only 160-ft. apart, so that the entrance is not worked as a lock.

Stockton-on-Tees has depths of 10-ft. at L.W. alongside some of its wharves, which are all tidal, and vessels of 21-ft. 6-in. draught can get up at H.W.

(j) **Scarborough.**—The depth at the outer ends of the south-west pier of the Main Harbour and the east quay, and at the reinforced concrete quay at the north or shore side of this harbour, are at least 16-ft. at H.W.O.S.T. All berths are tidal. There is a considerable area of the harbour which is much shoaler, and the reinforced concrete quay, which is about 1,000-ft. in length, is used normally for overseas trade. The result is that if a coaster is occupying the berth at the outer end of the south-west pier, and another coaster of moderate draught is to follow, the latter must wait outside the harbour until the former has gone out. It would be a great advantage if the present coaster berth at the south-west end of the south-west pier, which is a fish quay, unsuitable for coasting trade, could be given up to the fish trade and berthage allotted for coasters at the reinforced concrete quay, extended as necessary, and more of the shoals in the harbour removed in order to allow of freer movement. Deepening to allow a 14-ft. draught coaster to go to and from the quays at all states of the tide would not be financially possible. Access to the reinforced concrete quay for coasters of 14-ft. draught at neap tides might, however, be considered.

(k) **Hull.**—The part of the wet dock system which is mainly used by the coasting trade, consists of the Humber Dock, Princes Dock and Railway Dock. These form a group in the heart of the town, and are entered by the Humber Dock entrance.

This is 42½-ft. in width with 26¾-ft. on the cill at H.W.O.S.T., but the depth is reduced for a coaster of wide beam by the fact that the cill has haunches. Moreover, though there are two pairs of gates, these are so close that the length of lock, which is 158-ft., is too small to lock in anything except very small coasters. The entrance, therefore, is really one which may be taken as normally only giving access at times near to high water. The access to Princes' Lock is further limited by the passage to it from the Humber Dock, which is 38½-ft. in width, 21-ft. on the cill at H.W.O.S.T., also having haunches, which are equivalent to a reduction in its depth, a matter of importance at neap tides.

If the entrance to this system were extended to give a lock capable of locking coasters in and out, it would be an advantage to them. As the spring tidal range is over 20-ft., access at low water for a 14-ft. draught boat must be ruled out.

At Victoria Dock there is a certain amount of coastal trade, though this dock is mainly used by ocean-going vessels. Access to it is through a half-tide basin serving as a big lock, with 50-ft. width at the gates and 26¾-ft. on the cill at H.W.O.S.T. This half-tide basin enables a coaster arriving one or two hours after high water to be locked in as the basin is kept open as long as is consistent with the tide, and with the draught of vessels working in the basin. Here, again, obviously free access for a 14-ft. draught coaster at all states of the tide is not feasible.

At the Salt End Oil Jetties connecting to the big oil depôt and at the Riverside Pier adjoining Alexandra Dock, furnished with coal-loading appliances, coasters could come alongside at any state of the tide.

There are a number of tidal berths on the River Hull to which coasters of moderate draught can get at high water, but any question of a 14-ft. draught coaster getting to and from them at low water may be ruled out.

(l) **Goole.**—Vessels of 18-ft. 6-in. draught can get to Goole on spring tides, and 15-ft. 6-in. draught at neaps. With the present lock there is a length of 500-ft., a width of 47-ft., and 25-ft. on the cill at H.W.O.S.T. and 22-ft. at H.W.O.N.T., giving 10-ft. at L.W.S.T. and about the same at L.W.N.T. A new lock is being constructed to give greater length, width and draught.

The navigation of the River Humber is the governing factor for coasters going to and from Goole Docks.

(m) **Immingham.**—This dock, owned by the London and North-Eastern Railway Company is entered by a lock 840-ft. long, 90-ft. wide, with 47-ft. 11-in. on the cill at M.H.W.S.T., giving 27-ft. 11-in. on the cill at L.W.S.T. There is over 28-ft. alongside the tidal jetty at low water ordinary spring tides. Obviously, these depths are sufficient to allow access to any coaster at any time.

(n) **Grimsby.**—Access to the system of docks, which are owned by the London and North-Eastern Railway Company, is by a lock 295-ft. long, 70-ft. wide, with 26-ft. 3-in. on the cill at M.W.H.S.T. and 21-ft. 9-in. at M.H.W.N.T., giving 6-ft. 3-in. at L.W.S.T. and just under 11-ft. at L.W.N.T. This is sufficient to lock in a coaster of 14-ft. draught over a very considerable part of a tidal period, though not allowing of this at L.W.

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(o) **Boston.**—The entrance lock to the wet dock is 300-ft. long, with a minimum width of 45-ft., 24-ft. 6-in. on the cill at H.W.O.S.T., and 17-ft. 6-in. at H.W.O.N.T. The depth for vessels of considerable beam is lessened by the fact that the cill has haunches. Low water spring tide, according to the local authority, is 21-ft. below high water spring tide and not 17-ft. 6-in. as given in tide tables. Even on the latter assumption, it is obvious that 14-ft. draught coasters could not enter at low water, nor could they navigate the River Witham nor get to the tidal berths outside the wet dock.

(p) **King's Lynn.**—The entrance lock to the King's Lynn Docks is 200-ft. in length, 45-ft. in width at the round of the invert to the cill, and has up to 25-ft. on the cill at H.W.S.T. and 18-ft. at neaps. This would give only about 6-ft. on the cill at L.W.S.T., apart from which the length of the lock would not allow a large capacity modern coaster of 14-ft. draught to be locked in.

Vessels of 14-ft. draught can get to the town at neap tides.

Boal Quay, which is tidal, would have about 22-ft. at H.W.S.T., but could be deepened by dredging, if necessary, to give 25-ft. depth at high-water spring tides, and so 14-ft. draught vessels could get to this tidal berth over a fair range of tidal period.

(q) **Yarmouth.**—The spring tide range here is only a little over 6-ft., and the wharves are all tidal. The depths at a number of private wharves do not exceed 12-ft. at H.W. and 6-ft. at L.W. There is a length of quay where the Corporation handle all the roadstone imports, where 14-ft. draught vessels are fully water-borne at L.W. Other berths below this standard could be brought to it.

(r) **Lowestoft.**—Vessels of 14-ft. draught are stated to enter the harbour at any time of the tide. The depth in the Inner Harbour is given as 14-ft. L.W. and 19-ft. at H.W. Generally speaking, wharves, if below the standard of a 14-ft. draught, boat berthing at them at L.W. could if necessary be brought to that standard.

(s) **Ipswich.**—The entrance lock to the Wet Dock is 300-ft. in length, 50-ft. in width, and has 23-ft. 6-in. on the cill at H.W.O.S.T., 21-ft. at H.W.O.N.T., 12-ft. at L.W.O.N.T., and 10-ft. at L.W.O.S.T. Normally, the dock is put at a through level for from two hours before to one hour after high water, and special lockages can be made at other times. A number of the quays on the dock have depths of from 17-ft. to 25-ft. alongside, but some private wharves in the dock have only about 9-ft. alongside at neap tides.

There is a new tidal quay called the Cliff Quay, 1,200-ft. in length, with a depth alongside of 28-ft. at L.W.O.S.T., which could be extended if required. Naturally, the Port Authorities look on this as an ocean berth. The restriction on the movement of coasters at a port where the spring range is only slightly over 12-ft., which has been necessitated by their having to enter a wet dock is unfortunate.

There is ample frontage and area for further development, where the Commissioners have now built the Cliff Quay referred to above, which would allow coasters of 14-ft. draught to come and go at all states of the tide.

(t) **Felixstowe.**—This tidal dock is stated to be up to the standard of 14-ft. draught at all states of the tide.

(u) **Harwich.**—Omitting from consideration Parkeston Quay, which is the terminal for the continental traffic of the London and North-Eastern Railway, and which has 16-ft. to 20-ft. alongside at L.W., there is a jetty at the town of Harwich, also belonging to the London and North-Eastern Railway, 450-ft. in length and 100-ft. in breadth, laid out for railway traffic alone. It has 12-ft. alongside at L.W.O.S.T., corresponding to 24-ft. 6-in. at H.W.O.S.T.

(v) **Rochester.**—At this port there are both tidal wharves and a wet dock. (Strood Dock). In the River Medway there are stated to be some parts as shoal as 12-ft. at L.W. even below Gas Point, and above that as shoal as 6-ft. As the spring rise is over 18-ft. and the neap rise over 15-ft., 14-ft. draught coasters can get up and down over a lengthy tidal period even above Gas Point.

Wharves on the river are privately owned. One large coal-importing wharf has vessels of 23-ft. draught coming alongside, taking the ground at L.W.

Strood Dock, owned by the Southern Railway, has an entrance lock 108-ft. in length and 30-ft. wide, with 17-ft. 7-in. depth on the cill, but this is reduced by the haunches of the cill. This obviously could only be of use for small coasters.

(w) **Ramsgate.**—Vessels of 17-ft. to 18-ft. draught are stated to be able to enter the harbour at springs and 15-ft. to 16-ft. at neaps. The spring range is about 15-ft. Entrance to the wet dock (which is called the Inner Harbour) from the Outer Harbour is by either of the two entrances with gates, one 30-ft. wide and one 40-ft. The cills are at 16-ft. 4-in. below H.W.O.S.T., but being of curved sections limit the draught of boats to less than this.

Obviously, coasters of 14-ft. draught could not enter at any time. If the 40-ft. entrance were altered to a lock entrance it would allow freer working of coasters.

Alternatively, the west end of the south side of the quay, which separates the wet dock from the tidal harbour, might be considered for development as a tidal quay, provided that the run here was not too great, and that it could be cleared and kept clear of silt accumulations. There could not, however, be access for a 14-ft. draught coaster at L.W.O.S.T.

(x) **Dover.**—Wellington Dock and Granville Dock, the two wet docks, are both entered at about the time of H.W., as they have not lock entrances but single pairs of gates. Granville Dock, the deeper of the two, can take a 15-ft. draught vessel at neaps, Wellington only 9-ft. at neaps. The tidal Inner Harbour, from which these docks lead, does not offer much advantage as regards coasters going to and from berths there, owing to the small depth of water in it. This also would negative any great advantage that might be gained if the docks were entered by locks.

Berths in the outer deep-water harbour available for coasters at all states of the tide would be a great advantage.

(y) **Newhaven.**—All berths are tidal. The entrance has only 10-ft. at L.W.O.S.T., giving 29-ft. at H.W.O.S.T. and 24-ft. at H.W.O.N.T., and 13-ft. 6-in. at L.W.O.N.T. Deepening to 14-ft. draught at L.W.O.S.T. would involve considerable deepening of the entrance channel. The port is owned by the Southern Railway, and practically all trade has to go by rail.

(z) **Shoreham.**—The harbour entrance has not much more depth than 23-ft. at H.W.S.T., corresponding to about 6-ft. at L.W.S.T., and 8-ft. 6-in. at L.W.N.T. The entrance to the wet dock is by a new lock 220-ft. in length, 40-ft. wide, with 22-ft. 6-in. on the cill at M.H.W.O.S.T., corresponding to 18-ft. at neaps. Obviously, entrance at all states of the tide for a 14-ft. draught vessel is not possible.

(aa) **Portsmouth.**—Being a deep-water naval port, there is ample depth at the entrances for coasters at all states of the tide.

The two portions of the harbour used for coastal trade, namely, the Camber and Flathouse, are both tidal. At the Camber the depths at H.W.S.T. are 18-ft., giving 8-ft. at L.W.S.T. At Flathouse there are depths of 17-ft. at H.W.O.S.T. Access is, therefore, not possible for 14-ft. draught vessels at all states of the tide.

(bb) **Cowes.**—The depths at the wharves, which are all tidal, vary. One small private wharf has 7-ft. at L.W.S.T., the wharf at the Electric Generating Station has 8-ft., and the Southern Railway Company's wharf, which is 750-ft. in length, has 10-ft. at L.W.O.S.T. As the spring rise is about 10-ft. 6-in. and the neap rise over 8-ft., coasters of 14-ft. draught can get to these wharves, but not at all states of the tide.

(cc) **Southampton.**—This is a deep-sea port, which admits of the largest ocean-going vessels. The Southern Railway Company's docks deal with large ocean-going vessels, so that the draught of coasters taking coastwise cargo from there is not restricted. Coasting trade is mainly carried on at the Town Quay and at private wharves on the River Itchen, all being tidal berths. The Town Quay belonging to the Southampton Harbour Board has a number of berths, with from 16-ft. to 18-ft. at L.W.S.T., and others with from 3-ft. to 7-ft. at L.W.S.T. As the spring range is about 13-ft., these latter would give 16-ft. to 20-ft. at H.W.O.S.T., and from 14-ft. to 18-ft. at H.W.O.N.T. By constructing a new quay as a frontage to the shore between the Town Quay and the Royal Pier and dredging there, a further length of 500-ft. of deep coasting berths could be obtained, with ample width of quay. Additional quayage could also be given in a similar way on the land frontage to the East of the Town Quay, subject to certain frontage rights.

(dd) **Poole.**—The spring rise is only $6\frac{1}{2}$-ft., the neap rise $4\frac{3}{4}$-ft., and there is a double high water which practically equals a stand of high water for $3\frac{1}{2}$ hours. All quays are tidal. The harbour could be entered by a coaster over 14-ft. draught at any time, and the Hamworth Reclamation Scheme has provided a quay 520-ft. in length, with 16-ft. depth alongside at L.W.S.T., capable of extension if required.

(ee) **Weymouth.**—Harbour depths are given as 14-ft. at L.W. The spring rise is 7-ft., and neaps rise to about 3-ft. less height. A coaster of between 13-ft. and 14-ft. draught can reach the Trinity Road Jetty at practically all states of the tide. This is only a small wharf on the south side of the harbour. When we visited this port, alterations were being made at the Great Western Railway Company's wharves on the north side of the harbour, which would give extra berthage for the Railway Company's boats, and which would release about 475-ft. of quay for coasters.

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(ff) **Torquay.**—The berths are tidal, and a portion of the berth at the Haldon Pier, which is the Eastern breakwater, has a depth of 14-ft. at L.W.S.T. This is, however, narrow and only used in summer time for discharging timber. Beacon Quay, which is the main working quay, has only 8-ft. at L.W.S.T. at its deeper part. To obtain 14-ft. at all states of tide would involve very considerable outlay.

(gg) **Kingswear.**—This wharf has 15-ft. to 16-ft. depth alongside at low water.

(hh) **Plymouth.**—There is accommodation at this port at many berths for coasters of over 14-ft. draught at all states of the tide.

At the Victoria Wharves, which are tidal, there are depths of 25-ft. at L.W.O.S.T. at Cattedown Wharves, also tidal, 24-ft. at L.W.O.S.T., and at other tidal berths on the River Plym wharves with depths up to 8-ft. at L.W.O.S.T. In Sutton Harbour, which is also tidal, there are wharves having up to 21½-ft. at H.W.O.S.T., corresponding to over 14-ft. at half tide and 6-ft. at L.W.O.S.T.

At Milbay Docks, owned by the Great Western Railway Company, the tidal quays are used mainly in connection with ocean and cross-channel traffic, though coasters do discharge part cargo at one of these when waiting to go into the wet dock. The wet dock has ample depths, and the entrance is 80-ft. wide,

Maryport.

with 26-ft. on the cill at H.W.O.S.T. and 21-ft. at H.W.O.N.T. The spring rise is approximately 15-ft. 6-in., so that at L.W.O.S.T. there would only be about 10-ft. 6-in. on the cill. Apart from this, however, access to this wet dock is limited to near the time of high water, as it is entered by a simple entrance with gates and not by a lock.

(jj) **Fowey.**—Most of the jetties, which are tidal, have over 16-ft. depths alongside at L.W.O.S.T. All the working jetties belong to the Great Western Railway Company, and are used mainly for the shipment of china clay.

The Commissioners have no working quay to be counted as effective, but it would be possible to construct a jetty for general trade, independent of the Railway Company, if there were a demand.

(kk) **Falmouth.**—The Falmouth Docks Company, which has a large ship-repairing establishment where many large liners are dealt with, has many deep-water tidal quays. These do not accommodate coasters other than those dealing with materials and supplies for the Docks Company. If it was a paying proposition, they could arrange for tidal berths for coasters of 14-ft. draught and upwards at any state of the tide. Amongst other tidal berths are the Liverpool Wharf, a small wharf, having 16-ft. depth at its outer end at H.W.S.T., the Gas Works with 13-ft. alongside at H.W.S.T., and the Town Quay, a small tidal basin, with 14-ft. depth at H.W.S.T. None of these could be improved to take 14-ft. draught at low water, at a cost commensurate with the advantages to be gained.

Liverpool Wharf is only a very small quay, with 16-ft. depth at H.W.S.T. at one part and 10-ft. at another part, which is set back inshore. It would be possible to re-construct this wharf to give a considerable length of quay with more than 16-ft. depth at H.W.S.T.

(ll) **Penzance.**—At this port there are tidal quays and a wet dock. The depths at the south pier extension, the tidal berth which takes the Scilly Island Trade, has 24-ft. at the outer end and 17-ft. at the inner end at spring tides. The spring range is 18-ft., so that there would only be 6-ft. at L.W.S.T.

The cill of the wet dock is at 20-ft. below H.W.O.S.T., and as there is only a single pair of gates, times of entrance are restricted. The width is ample for coasters, and if it had been a lock entrance coasters of 14-ft. draught could have entered over a considerably longer period of tide. The Albert Pier is the only wharf with rail connection, the depth alongside at the outer end is 15-ft. at H.W.S.T., and at the inner end 11-ft. at H.W.S.T. At neap tides there would be 3-ft. 9-in. less. Widening and deepening at the outer end would give improved accommodation.

(mm) **Newlyn.**—This harbour is tidal, and the depth at the outer end of the south breakwater, where stone is loaded, is given as 12-ft. at L.W.

(nn) **Watchet.**—This is a tidal harbour, having a depth of 24-ft. at H.W.S.T. at the pierheads. The trade here is specialised for paper mills and, except for coal, would not normally be coastwise trade as esparto grass and wood pulp would be overseas trade. Coal is discharged at a berth where there is 24-ft. alongside at H.W.S.T. The tidal range here must be very great, probably equal to Barry Docks on the opposite side of the channel, where the spring range is 35-ft. 6-in. Any idea of access at all states of the tide for even a light draught coaster is obviously impossible.

(oo) **Bristol and Avonmouth.**—Bristol and Avonmouth Docks are wet docks, entered by locks capable of taking ocean-going vessels and so easily capable of locking in any coaster. Any idea of giving access to the locks and entrance at low water for 14-ft. draught coasters is out of the question, owing to the great tidal range.

(pp) **Sharpness and Gloucester.**—Sharpness Docks are entered from the Severn by a lock 320-ft. in length and 60-ft. in breadth, obviously greater than required by coasters. The great tidal range at Sharpness must always limit the period of entry. The Gloucester and Berkley Ship Canal connects Gloucester to Sharpness. After locking in at Sharpness, there are no other locks to pass, so that the only restriction as to period of access is that of entering and leaving the system at Sharpness.

(qq) **Newport.**—Access to the tidal wharves at Newport is limited as to time by the great tidal range, which is about 38-ft. at springs. Various private wharves have depths ranging up to as much as 27½-ft. at H.W.S.T., and 17½-ft. at H.W.N.T., but these would not take a 14-ft. draught coaster at half tide.

The large wet-dock system of the Great Western Railway is entered by a lock which takes ocean-going vessels, and has 45-ft. of water on the cill at springs. That would not allow of entrance at low water, even if the great lock were used for locking in coasters. Actually, the wet docks are not much used for locking in coasters, though there is some transhipment of cargo. Obviously, access to either tidal berths or the wet docks for 14-ft. draught coasters at low water could not be given.

(rr) **Cardiff.**—The periods of entrance to the wet docks at Cardiff are limited, owing to the great tidal range, which dries out the entrances to the Bute Docks, which form the real coastal section of the docks. The Roath and Alexandra Docks also could not be entered at all states of the tide for the same reason, nor could any alterations be envisaged to provide this.

(ss) **Penarth Harbour.**—The tidal berths at the Great Western Railway Company's coal tips in Penarth Harbour have over 30-ft. at H.W.O.S.T., and there is over 30-ft. in the channels at H.W.O.S.T., but as the tidal range is approximately 36½-ft., any idea of access at all states of the tide for a 14-ft. draught coaster could not be considered. The same applies to Penarth Dock, where the depth on cill is 35-ft. 6-in. at H.W.O.S.T.

(tt) **Barry Docks.**—These wet docks are entered through the basin, which can be used as a large lock, or through the Lady Windsor deep lock. The latter is 647-ft. in length, 65-ft. in width, with 48-ft. 6-in. over the cill at H.W.O.S.T. and 40-ft. at H.W.O.N.T. The approach to it is kept dredged to 4-ft. above dock cill. The tidal range is about 35-ft. 6-in., so that it would be possible for a vessel of 14-ft. draught to lock in or out at almost any state of the tide, though not at L.W.S.T.

(uu) **Port Talbot.**—Access to this wet dock is by a dredged channel. The tidal range here is great, about 28-ft., and there would be 3-ft. less in the channel than on the outer dock cill, and this is maintained by dredging. The depth on the outer

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dock cill is 33-ft. 9-in. at H.W.O.S.T., so any idea of coasters of 14-ft. draught entering at L.W.O.S.T. would be impossible. The dock is a fresh-water dock fed by two rivers, so to prevent loss of water, lockage for coasters through the big entrance basin is restricted to near the top of the tide.

(vv) **Briton Ferry.**—The dock is entered from the River Neath by an outer tidal basin. The dock entrance, which is 50-ft. wide with 25-ft. on the cill at H.W.O.S.T. and 17-ft. at H.W.O.N.T., has only a single pair of gates.

(ww) **Swansea.**—At Swansea the coastal trade is mainly dealt with in wet docks. The spring range is about 27-ft. 9-in. The depth on the cill of the North Dock is 32-ft., and as entrance is through a single pair of gates and not through a lock, access to coasters is limited to near the time of high water, though the width of entrance, 58-ft., is very big.

The South Lock has an entrance lock 370-ft. in length, 58-ft. in breadth, with 36-ft. on the cill at H.W.O.S.T. and 20½-ft. at neaps, and the depths in the dock are given as normally 21-ft..

Lockage to this dock goes on over a range of five hours. Depths outside are the restriction, and to bring these to a 14-ft. standard at L.W. would be out of the question.

Most of the coasting trade is at the above docks. The King's Dock, which is mainly for ocean-going vessels, has 40-ft. of water on the cill of the entrance lock, which is 875-ft. in length and 90-ft. in width, and has about 14-ft. depth at L.W.O.S.T. in the approaches. The Queen's Dock, which has a big oil depôt linked to the Llandacry Refineries, leads out of this system, and the oil berths are used by coasting oil tankers, so that the depths at this entrance are of value to coasters.

(xx) **Llanelly.**—At this port there are both wet docks and tidal quays. The Commissioner's wet dock, called the North Dock, has its cill at zero of the tide table, the width of entrance is 53-ft., and the depth on cill is given as 27-ft. at H.W.O.S.T. and 19-ft. at H.W.O.N.T. It is closed by a single pair of gates, and ingress and egress is restricted to near times of high water. It is stated that owing to the time of steaming to or from the bar, which is about 7½ miles away, and the depth there being only about 6-ft. more than on the cill of the dock, vessels could not reach or leave the entrance at any appreciable time outside the present times of working the entrance.

At Messrs. Nevill's Dock and Railway Company Limited's dock the wet dock has only a 31-ft. entrance, with 20-ft. on the cill at H.W.O.S.T. and 12-ft. at H.W.O.N.T. There are, however, tidal wharves there with 23-ft. 6-in. at H.W.O.S.T. and 15-ft. 6-in. at H.W.O.N.T.

The entrance channel depths would, of course, preclude 14-ft. draught coasters moving to or from any of these docks or tidal wharves at low water, as the Spring rise is given by the official port records as 26-ft.

(yy) **Milford.**—The Milford Docks Company's docks are entered by a lock over 540-ft. in length, with 34-ft. on the cill at M.H.W.S. and 28-ft. at M.H.W.N. The tidal range is about 20-ft. A coaster of 14-ft. draught could therefore lock in at almost any time if permitted, though the depth in the dredged cut of the approach is given as only 12-ft. at L.W. Locking is not normally employed, the dock being opened through from two hours before high water until high water, though an important coaster that had missed the tide would be locked through. Apart from the depths in the approach, the size of the locks renders access at all times for a coaster of 14-ft. draught a proposition not likely to be justified, as it would involve great loss of water in locking.

(zz) **Fishguard New Harbour.**—The tidal quays here, having 20-ft. alongside at low water and 33-ft. 6-in. at high water of spring tides, give access at all states of the tide to vessels far above the 14-ft. draught standard. It is, however, used almost exclusively for the Great Western Railway Company's Irish cross-channel traffic.

(aaa) **Aberdovey.**—The wharves here are tidal. The deepest wharf is stated to be held on lease by the Great Western Railway Company. Both this wharf and the shoaler wharf inshore of it had no depths at low water a year or two ago, through silting, which was partly due to obstructions. This silting arrested difficulties for the town and, being consulted by them at that time, we advised the removal of the obstructions with the contingency of other remedial measures. The silting has now cleared itself, and a 14-ft. draught coaster can get alongside the deeper wharf at any state of the tide.

(bbb) **Holyhead.**—The Old Harbour, which is the working harbour, is leased to the London, Midland and Scottish Railway. The quays are tidal, and the principal quay has depths up to 17-ft. at low water. The London, Midland and Scottish Railway use this harbour for their own trade, and there is only one quay which can be used without the Railway Company's leave. This quay has a least depth of 12-ft. at low water, but it has only a narrow width. There is a good stone quay in the outer harbour, but that has only 12-ft. 6-in. depth at H.W.O.S.T. and about 9-ft. at H.W.O.N.T. To get wharves there to which 14-ft. draught coasters could have access at all states of the tide would involve extensive works.

(ccc) **Deganwy.**—This tidal quay is 660-ft. in length, with 20-ft. depth at H.W.S.T. and 14-ft. at H.W.N.T. It belongs to the London, Midland and Scottish Railway, and is near to Llandudno lying in the Conway Estuary. Access for 14-ft. draught coasters at all states of the tide is out of the question.

(ddd) **Liverpool.**—At this large ocean port 14-ft. draught coasters can come to the dock entrances at all states of the tide. Access to the Princes-Bramley Moore system, where most of the coastwise trade is carried on, is by the Prince's Entrances or by the Salisbury Entrance or the Sandon Entrances. Vessels can enter through the Prince's Entrance from two hours before to 2½ hours after high water, and a 14-ft. draught vessel could pass at 2½ hours after high water of a 22-ft. tide, which is a smaller tide than a mean neap tide. If vessels miss the tide here they could work in or out at the Canada Lock further north than these other entrances. There a 14-ft. draught coaster could pass at four hours after high water on a 27-ft. tide, or five hours after high water on a 20-ft. tide, but on a big spring tide at only 3¾ hours after high water. If locking in or out at Gladstone Lock, which is the great lock for the largest ocean-going ships, a coaster from Prince's Dock would have to traverse about three miles of dock systems, which would take probably over two hours. A lock entrance to the Salisbury-Princes system of docks designed for coasters to allow them to pass in and out over a much longer range of tide, would be of very definite advantage to the coasting trade. The small group of coasting docks further south can be entered by the Canning Entrances by a 14-ft. draught coaster from two hours before high water to two hours after, except on poor neap tides when the times are more restricted. As an alternative, it could work through the Brunswick Lock at any time on a 25-ft. or lesser tide, and as late as five hours after high water on a 30-ft. tide. On the Cheshire side of the river coasters of 14-ft. draught could lock in at any time of a 28-ft. tide and up to 5½ hours after H.W. on a 32-ft. tide. There on neap tides locking is only allowed up to four hours after high water on account of the loss of water to the system.

(eee) **Garston.**—There are three entrances to the Garston Docks, which are wet docks, owned by the London, Midland and Scottish Railway. The docks are also interconnected. The main lock entrance is that to the Stalbridge Dock. This lock is 276-ft. in length, 68-ft. in width, with 34-ft. depth on cill at H.W.O.S.T. and 25-ft. at H.W.O.N.T. As the spring rise is about 28-ft. 6-in., entrance is restricted even for a 14-ft. draught coaster. Depths outside the lock would also set a limit to the times of entrance. In practice, coasters entering through the Stalbridge Lock in order to berth in the Stalbridge Dock or in one of the other two docks, work in from three hours before to three hours after high water. The other two entrances are closed by single pairs of gates, and have 28-ft. and 25-ft. respectively on the cills at H.W.O.S.T., and these are only used from 1½ hours before high water to high water.

(fff) **Manchester, including Ellesmere Port.**—To get to or from Manchester coasters traverse the Ship Canal, locking in or out at the locks at Eastham from three hours before to three hours after high water.

The channel in the River Mersey, leading to the Eastham Locks, would not permit 14-ft. draught coasters to get to and from these locks at L.W.S.T. At spring tides a 14-ft. draught coaster could go part way, i.e., to Runcorn by the River Mersey and lock in at Weston Point or Runcorn.

(ggg) **River Beaver Navigation.**—Access from the Manchester Ship Canal, which takes ocean-going vessels, allows of coasters of 14-ft. 6-in. draught passing over the cills into the Weaver. All locks on the system have 15-ft. over the cills, their width is 42-ft. and length 240-ft. This length is somewhat restricted for the latest type of coaster of 14-ft. draught. The working depth of the navigation is given as 10-ft. 6-in., but a great deal of it is equal to a 14-ft. standard draught, and the remainder could be brought to that standard by dredging out where necessary.

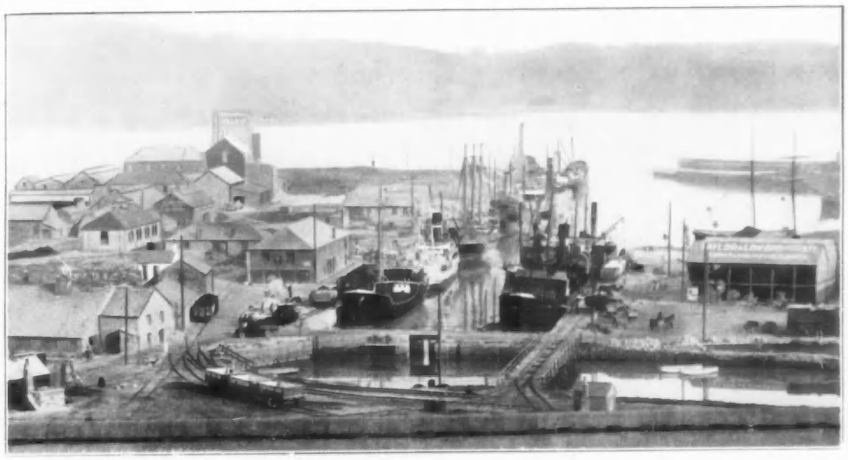
(hhh) **Preston.**—On spring tides vessels up to 22-ft. 6-in. draught can get up the River Ribble to Preston, and on neap vessels up to 16-ft. 6-in. draught. Vessels of 14-ft. could not get up to Preston at low water of either springs or neaps as the river falls to about 20-ft. 6-in. below H.W.S.T. at low water of both neap and spring tides.

The approach to Preston is through a long trained and dredged cut, rendering any idea of improvement to a 14-ft. draught at low water quite beyond the limits of financial possibility. There are both tidal quays and a wet dock at Preston. The former have depths up to 17-ft. at H.W.S.T. and 11-ft. at H.W.N.T.

Facilities for Coastal Trade at Smaller British Ports—continued

The lock entrance to the dock system is 550-ft. in length, with an intermediate pair of gates, 66-ft. in width, with 29-ft. 6-in. on the cill at H.W.O.S.T. On spring tides the gates are opened right through. Lockings are made from 2½ hours before to 2½ hours after H.W.

(jjj) **Fleetwood.**—There are both tidal quays and a wet-dock system at Fleetwood, the London, Midland and Scottish Railway Company being the owners. The entrance to the dock system is through a lock 250-ft. in length and 50-ft. wide at quay level, with a depth on cill of 24¼-ft. at H.W.O.S.T. and 17-ft. 9-in. at H.W.O.N.T. As springs rise 27½-ft., access is limited. Vessels lock in from 2½ hours before H.W. to such time after H.W., as is necessary, to keep sufficient depth in the docks. The depths at the tidal berths vary, part being kept to 12-ft. below low water. The depth over the bar is given as 15-ft., with 1-ft. less in the channel, so that although 14-ft. draught boats could not get to a tidal berth at any time, they could do so over a great part of the tidal period.



Par Harbour.

(kkk) **Heysham.**—This port is owned by the London, Midland and Scottish Railway.

The quays are tidal, and there is a depth of 17-ft. at them at low water ordinary spring tides. The depths outside the harbour are much greater. There is, therefore, ready access for vessels of even more than 14-ft. draught at all states of the tide.

(lll) **Barrow.**—This also is a London, Midland and Scottish Railway port.

The docks are entered by a basin and lock. The basin entrance, 97-ft. 3-in. wide, is closed by a pair of gates, with 31-ft. 6-in. on the cill at H.W.O.S.T. and 24-ft. at H.W.N.T. These are opened about two hours before H.W. and closed at H.W., so that access is restricted to a short period.

(mmm) **Whitehaven.**—Here there are both tidal berths and a wet dock. The entrance to the wet dock is 50-ft. wide, closed by a single pair of gates, and having 21-ft. on the cill at high water of ordinary spring tides and 14-ft. at high water of neaps. Those parts of the tidal quays in present use have 2-ft. 6-in. to 3-ft. less depth than there is on the dock cill. Entry to the wet dock is restricted to the period of two hours before H.W. to as late at times as two hours after H.W.

The harbour is dry at low water, and could not be brought to a 14-ft. draught standard at all states of the tide. Accommodation could, however, be greatly improved by remodelling some of its features.

(nnn) **Workington.**—This port has both a wet dock and tidal wharves. The wet dock entrance is 70-ft. in width, with 30-ft. on the cill at high water ordinary spring tides and 24-ft. 6-in. at high water ordinary neap tides.

Though having only a single pair of gates, these would be opened 2½ hours before H.W. and kept open to 2½ hours after H.W., unless there were some very deep draughted vessel in dock, so that there is a fairly long period of working in and out of dock. The tidal berths are given as having 20-ft. at H.W.O.S.T. and 14-ft. 6-in. at neaps, the tidal range being 24-ft. 3-in. at springs. The tidal berth adjoining the wet dock is not considered suitable for coasters to take the ground owing to possibilities of the river cutting in and making the layerage bad. It could be dredged deeper to allow of a longer period in which a coaster could float. At other tidal quays coasters can take the ground. The approach channel is 2-ft. 6-in. below dock cill level, so access at all states of the tide for a 14-ft. draught coaster is out of the question, even if the tidal berths permitted them to get alongside.

(ooo) **Maryport.**—The accommodation here is practically all in wet docks. The deeper entrance, closed by a single pair of gates, can pass in a 46-ft. beam vessel, and there is 25-ft. on the cill at H.W.O.S.T. and 19-ft. at H.W.O.N.T. The spring range is 25-ft., so entrance and exit are restricted to times near to high water. At the entrance to the harbour and channel to this dock there is only about 2-ft. more depth than at the cill, and access of a 14-ft. draught boat at all states of the tide is obviously impracticable.

(ppp) **Silloth.**—This is a London and North-Eastern Railway port.

There is a tidal basin, from which a wet dock is entered. The entrance to this wet dock is 57ft- wide, it has only a single pair of gates, and has 23-ft. on the cill at H.W.O.S.T. and 17-ft. at H.W.O.N.T. These gates are opened 2½ hours before H.W. and closed at H.W. The tidal basin has silted up greatly, and part of its quayage is no longer used. Apart from lack of depth, vessels would find the entrance to the tidal basin awkward if the ebb tide were running, as it runs fast and would tend to pin them on the south-west jetty. Any idea of bringing this port to a 14-ft. draught standard on all states of the tide may be dismissed.

Ports taking Large Coasting Colliers

(16) In the notes on various ports in the preceding paragraph we have discussed accommodation on the basis of 14-ft. draught as a reasonable general draught for coasters. There is, however, a large trade in coastwise coal carried on by coasting colliers having a greater draught, a great deal of it for trade purposes and for bunkers at other ports.

At ports having this special trade in the shipment of coal, any modification giving longer times of access to the coaling berths for these deeper-draughted colliers would naturally be an advantage. This also applies to the berths at which coal is discharged.

Ports where the deepest-draught coasting colliers could get to and from coaling berths at all states of the tide are Blyth, the Tyne (tidal berths) and Immingham. At Sunderland, Hartlepool, Middlesborough and Hull on the north-east coast, Newport, Cardiff, Penarth, Barry, Port Talbot and Swansea of the South Wales ports, Liverpool, Garston, the Manchester Ship Canal and Workington on the north-west coast, there are coal-shipping berths at which coasting colliers of the heaviest draught could get at some states of the tide, though not at all states of the tide.

(17) Amongst ports to which coastwise coal is shipped, excluding the Port of London, berths at commercial quays which a coasting collier of the heaviest draught could reach at any state of the tide exist at Ipswich, Southampton and Plymouth. Other ports to which coasting colliers of heavy draught could get at some states of the tide are Rochester, Newhaven and Kingswear in Devon. In view of this trade being a specialised one, it does not appear likely that any general attempt to bring accommodation at other ports up to the draught of these big coasting colliers would be found practicable.

Lighting at some Smaller Ports.

(18) Before passing on to a consideration of Scottish Ports, we wish to draw attention to the possibility of assisting coasting trade at one or two small English Ports by lighting the approaches or improving the lighting. Those about which representations were made to us were Keadby, Wisbech, Wells-on-Sea and Whitstable. As regards the latter, some objection appears to be entertained to the present leading light as being liable to be confused with the numerous lights of the town, the possibility of its having a more distinctive character might be considered.

The River Trent is not lighted up to Keadby, and so navigation is restricted. We understand that there are no light dues levied, but the possibility of installing a system of lighting and defraying the costs by charges might be considered. At Wells-on-Sea the approach channel is not lighted. The great length of this is almost straight after the shelter of the long embankment has been reached, and as the port can only be entered and left over very restricted periods of time lighting would be a great advantage. At Wisbech the lighting of the channel of the River Nene on which it is situated deserves investigation. Even if only lighted as far up as Sutton Bridge, lighting should be of assistance by enabling coasters to work that far by night as well as by day. The objection to vessels having to wait at Sutton Bridge for daylight would be the difficulty of holding vessels there unless there were proper lay-byes provided as the rush of tide is stated to be objectionable.

Bombay Port Trust

Excerpts from Administration Report, 1935-36

After five deficit years in succession the year 1935-36 closed with a small surplus of Rs. 2.26 lakhs mainly achieved by reduction in expenditure. The year's revenue commenced with a downward trend and except for the Bunders which showed good signs of recovery, receipts from the docks, railways and land continued to fall steadily until about November when the drop was arrested. Since then the trade of the port has scarcely looked back and although the total receipts from trade sources for the year have not quite come up to the total of last year, on the whole the trend of trade appears to be now definitely upwards although it has still a long way to go before reaching the predepression levels of some six years ago.

The League of Nations' published statistics indicate that the volume of world trade is slowly expanding, the Index rising from 77.1 (1929=100) to 79.4 between the first quarters of 1935 and 1936. Taking corresponding figures for the Port of Bombay, trade receipts rose from 77.2 to 84.6 (1929=100), between the same periods, which appears to indicate that the trade of this port was about the same as and the recent expansion somewhat better than the average of the world during the above periods.

During the year under review, the Trustees continued their policy of granting relief to trade by reductions of rates and charges wherever possible. The principal reductions and the financial sacrifice of revenue which they entailed are summarised below:—

		Rs. Lakhs per annum
(*a*)	General relief to leaseholders and tenants, including Cotton Depot and Ryan Grain Market	3·58
(*b*)	Abolition of initial storage charges at the warehouses	·75

The Revenue Estimates for the year under review were based on an expectation of an improvement of about 1½ per cent. in receipts from direct trade sources over the corresponding actuals for 1934-35. The total estimated revenue was Rs. 250.84 lakhs but this figure was reduced to Rs. 240.74 lakhs in the Revised Estimates. The actual receipts amounted to Rs. 242.93 lakhs, the increase of Rs. 2.19 lakhs being due to the general improvement which set in towards the end of the year. For purposes of comparison the receipts for the six years ending with the year under report are quoted below, the necessary adjustments having been made to allow for equalisation of the surtax throughout the period:—

	Rs. Lakhs
1930-31	254.98
1931-32	232.42
1932-33	223.76
1933-34	230.88
1934-35	229.44
1935-36	228.32

The original expenditure estimate of Rs. 248.96 lakhs was reduced, by eliminating all avoidable items, to Rs. 243.06 lakhs in the revised budget; owing to further economies effected in all departments the actual expenditure for the year did not exceed Rs. 239.75 lakhs, a saving of Rs. 9.21 lakhs on the original estimate and Rs. 3.31 lakhs on the revised The ratio of working expenses to revenue in the year under review was 50.05 per cent., a decrease of about 1.07 per cent. on that of the previous year.

The revised budget estimates for the year anticipated a deficit of Rs. 2.79 lakhs under general account and a surplus of Rs. .46 lakh under Pilotage Account; the actual result was a surplus of Rs. 2.26 lakhs under General Account, which has been transferred to the Revenue Reserve Fund, and Rs. .92 lakh under Pilotage Account, which has been transferred to the Vessels Replacement Fund.

The Ballard Pier berth was used by 179 vessels during the year, and 303 postal and passenger trains were run to and from the station, connecting with the incoming and outgoing mail steamers and other large passenger liners. The additional passenger berth on the Alexandra Dock Harbour Wall accommodated 63 vessels.

The Docks Hamallage (Labour) Department dealt with all demands for labour during the year and the attendance of the labourers continued to be satisfactory. The average number engaged daily was 1,888 and the maximum employed on a single day 3,471. The total volume of goods handled by Port Trust labour during 1935-36 amounted to 2,885,429 tons, the inclusive labour charges averaging 3.84 annas per ton as against 4.15 annas per ton in the preceding year.

The foreign inward and outward traffic on the Port Trust Railway aggregated 1,417,000 tons as against 1,391,000 tons during 1934-35, the principal increases being in cotton and kerosene oil. A decrease of 1,680 wagon-loads has to be recorded in local traffic, principally under machinery, rice, sugar and oil-cakes. The railway carried 39 per cent. of the total rail-borne traffic in and out of Bombay and the freight earnings collected during the year on traffic booked or received on account of the G. I. P. and B. B. and C. I. Railways amounted to Rs. 237 lakhs as against Rs. 229 lakhs last year.

The Government of India convened a conference of representatives of the Bombay, Calcutta and Karachi Port Trusts, Shipping Companies and Chambers of Commerce at Delhi on 20th December, 1935, to discuss with the Railway Board the question of the diversion of inter-port coastal traffic from the sea to the rail route. The matter was discussed generally but no definite formula for general application was found practicable. The Railway Board, however, agreed that individual railway administrations should in future conduct negotiations directly with the port administration concerned in any particular case in which traffic interests conflicted with a view to the elimination of any wasteful competition which might be found to exist.

The Government of Bombay requested the Trustees to consider the practicability of evolving a suitable scheme in the Port of Bombay on the lines of the recommendations of the Royal Commission on Labour for decasualisation and registration of dock labour. The Trustees informed Government that while they were in entire agreement with the view that the interests of the port as well as of the workers in general lay in the stabilisation of labour, they considered that the nature of the problem at the major Indian ports was essentially different from that which existed at the Ports of Great Britain and that any attempt to substitute, under present conditions, an official system of individual registration for the existing arrangement would be most inadvisable. It was further pointed out that the labour which operated at this port was not "casual" in the sense in which labour in Great Britain was casual and that in their present arrangement of a considerable number of gangmen controlling gangs coming from the same villages or district and working under the strict supervision of a Labour Department, the Trustees had in effect a registration system which works towards the same end, viz., the decasualisation of labour. This system had been evolved after long experience and was more suitable to Indian conditions than the more elaborate scheme required by the proposals of the Royal Commission.

A draft Bill for the institution of Port Sanitary Authorities in the Major Ports of India was referred to the Trustees by Government for remarks. The Trustees informed Government that, subject to detailed examination and comments on the provisions of the Bill after it was finally revised, they were in favour of the proposed scheme provided their financial liability did not exceed the expenditure at present incurred by the Trust and reiterated their view that the Port Trust should be appointed as the Port Sanitary Authority as they were deeply concerned in the International reputation of the port in the matter of its sanitary regulations and arrangements and that the duties of the Sanitary Authority at the Docks and Bunders would be most easily and economically undertaken by the Port Trust staff who had been carrying out these duties hitherto.

	Imports (Tons)			Exports (Tons)			Total (Tons)		
	1934-35	1935-36	—	1934-35	1935-36	—	1934-35	1935-36	—
Docks	2,070,000	1,996,000	—74,000	2,009,000	1,925,000	—84,000	4,079,000	3,921,000	—158,000
Bunders	1,099,000	1,145,000	+46,000	263,000	252,000	—11,000	1,362,000	1,397,000	+35,000
Total ...	3,169,000	3,141,000	—28,000	2,272,000	2,177,000	—95,000	5,441,000	5,318,000	—123,000

The cargo handled at the docks and bunders amounted to 5,318,000 tons, a decrease of 123,000 tons as compared with the volume of the previous year. Imports accounted for about 59 per cent. and exports 41 per cent. of the total tonnage. The decrease in tonnage was equivalent to 2.3 per cent. Imports decreased by .88 per cent. and exports by 4.2 per cent. The table above gives a detailed comparison of the figures for the past two years.

Vessels which entered the docks or were berthed at the Harbour Walls (excluding ferry-steamers) totalled 1,950 with an aggregate tonnage of 5,096,662 net register as against 1,904 vessels with a tonnage of 5,030,637 in the preceding year.

The dry docks were occupied during the year by 170 vessels as against 146 vessels in 1934-35. The total tonnage increased to 652,788 tons, being 163,761 tons more than in the previous year.

Maintenance Dredging.

The total quantity of revenue dredging during the year was 2,747,540 tons, as against 3,056,460 tons in 1934-35. The average cost per ton on maintenance dredging was 2.04 annas per ton, as against 3.59 annas in the preceding year.

Sale of Plant.

The hopper dredger "Silurus" ordered out in 1914 for deepening Alexandra Dock Approach and Entrance Channels, which was surplus to requirements, was sold to the Union Government of South Africa for £20,000.

National Maritime Museum

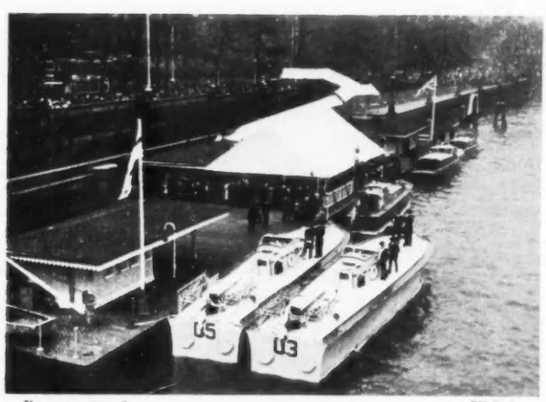
Opened by His Majesty the King

By courtesy] [P.L.A

The Queen's House, Greenwich, home of the National Maritime Museum, seen from the Royal Park.

THE opening of the National Maritime Museum at Greenwich by H.M. The King was an event of outstanding interest in nautical affairs. The Museum has been founded to provide the public with facilities to study the history of British maritime progress and development, and the Nation now has a unique record of more than four centuries of English seafaring history, from the time of the Elizabethan adventurers down to the present day.

It is largely due to the generosity and initiative of Sir James Caird that the National Maritime Museum has at last come into existence. The nucleus of the collection consists of the Macpherson maritime prints and the Mercury ship models, all of which, together with various other objects from private collections, Sir James Caird bought, with a view to establishing a representative collection of maritime exhibits. Following the decision that the Greenwich Hospital School should move to Holbrook, the Admiralty announced in 1927 that the seventeenth-century Queen's House at Greenwich, and the two more recent wings, would be available for a museum. Sir James Caird contributed generously to the restoration and conversion of the museum buildings, and Earl Stanhope, chairman of the Museum Trustees, gave the Bill his support in the house of Lords. Royal Assent was granted in July, 1934, and since then,



By courtesy] [P.L.A

Westminster Pier as seen from Westminster Bridge just before the arrival of the King and Queen. The P.L.A. Launch Nore, which led the procession down the river, is moored alongside the Pier. Behind it is the Barge of Admiral Sir Edward R. G. R. Evans, Commander-in-Chief of the Nore, in which Their Majesties made the journey to Greenwich, and two of the four Motor Torpedo Boats which provided the escort.

the Queen's House, which is now classed as an Ancient Monument, has been restored with the greatest care, so that its appearance to-day is much the same as it was three hundred years ago.

The contents of the National Maritime Museum must be seen to be appreciated. The arrangement is chronological, and exhibits relating to the seventeenth century and earlier are to be found, including many valuable pictures. One of the most interesting sections is the Navigation Room, which gives a complete review of the progress of navigation from the time of the Tudors, and contains fascinating sixteenth-century globes and maps, the latter illustrated with great imagination; astronomical instruments; a whole series of sextants; compasses, some jewelled, some in carved ivory; telescopes bound in coloured leather and shagreen. One example is made of decorated parchment, and extends to a length of eight feet.

The Museum was officially opened on the 27th April last by His Majesty, who was accompanied by the Queen and Princess Elizabeth. The journey from Westminster Pier to Greenwich was made by barge, and Their Majesties were escorted by four motor torpedo boats.

Upon disembarking at Greenwich, the Lord Mayor presented the King with a loyal address. The Royal Party then entered the Royal Navy College grounds through the river gate, drove past the Dreadnought Hospital, through the western gate and

By courtesy] [P.L.A

Ships in the Pool of London decorated for the Royal Visit to Greenwich.

into the grounds of the Queen's House, where they were received by Earl Stanhope, chairman, Sir James Caird and Sir George Hope, trustees, and the Director of the National Maritime Museum, Professor Geoffrey Callender. Earl Stanhope presented the Queen with a golden key, with which she opened the centre door leading to the main hall of the Queen's House, thence proceeding to Neptune's Hall, where a number of guests were waiting. Representatives of maritime interests of all kinds, as well as the mayors of many seaport towns, and members of port and dock authorities, were present.

In declaring the National Maritime Museum open to the public, His Majesty said: "It is a great pleasure to the Queen and myself to come here to-day to open the National Maritime Museum and to see the representatives of the seaports and maritime interests of our country. My early life was spent in the Royal Navy, and I am glad that the opening of this museum should be one of the first ceremonies of my reign. But for the enterprise, the courage and the character of our seamen, the British Comonwealth of Nations would never have come into existence. In the belief that it will help to further the knowledge of our glorious maritime history, I have much pleasure in declaring open the National Maritime Museum."

The Coronation

(*continued from page 219*)

On Saturday, May 15th, a Coronation Regatta was held off the Royal Pier between the old and new docks. The Royal Navy, Merchant Navy and a number of rowing and sailing clubs were represented. The Docks and Marine Manager invited the public to watch the races from specially-prepared enclosures on the Southern Railway's Docks Extension Estate, and spectators were also accommodated on the new recreation ground adjoining. One of the most interesting events was a liner's lifeboat race, in which several of the local shipping companies participated.

LIVERPOOL.

The celebrations at Liverpool were heralded by the ringing of bells at the Municipal Offices and also at the various churches throughout the city and suburbs. Later, heavy gunfire proclaimed the crowning of His Majesty the King. The Mersey Division of the Royal Naval Volunteer Reserve fired a Royal Salute of 21 guns from the plateau in the new Pierhead Gardens overlooking the river. His Majesty's forces played an important part throughout the day. Assembling at their respective headquarters. Army, Navy, and Air Force Contingents in the City marched past the Town Hall, the Deputy Lord Mayor taking the salute. There were also a number of pageant displays, military and other parades. In the absence of the Lord Mayor and Lady Mayoress, who were at Westminster Abbey, the Deputy Lord Mayor gave a reception at the Town Hall.

An imposing river spectacle was also held, and in this, the Corporations of Bootle, Birkenhead and Wallasey, together with the Mersey Docks and Harbour Board, co-operated with the Lord Mayor of Liverpool and the shipowners of the port. A number of ships were anchored in the river, dressed by day and illuminated by night. Five liners took part in the display and it was an unusual sight to see so many liners moored in the river at the same time. Gaily decorated in mid-stream, they presented an impressive spectacle, especially in the evening when they were illuminated by hundreds of coloured lights. River trips for the public were organised in addition. The Liverpool landing stage, which is half-a-mile in length, and at which ocean passengers embark and disembark, was painted cream and black.

Employees of the Dock Board who are on the permanent staff, were allowed the day off, with full pay, and other workmen who have been regularly employed during the six months preceding Coronation Day, were also granted leave with pay.

GLASGOW.

The head offices of the Clyde Navigation Trust were tastefully decorated, as were also the city berths for the River Passenger Steamers, from which a number of excursions for children and other citizens were run by the Corporation of Glasgow.

Among the numerous attractions which were arranged was a Military Parade in George Square. It was attended by Bluejackets of the Clyde Division of the Royal Naval Volunteer Reserve, the Highland Light Infantry, contingents of the Territorial Army, mechanised units of the Royal Artillery and detachments of the Royal Air Force.

In the evening huge bonfires were set alight at the various public parks and there were impressive displays of fireworks.

Employees of every grade on Coronation Day received a holiday with pay, as on the day of the Jubilee of King George V.

The Coronation celebrations were continued on 17th May, when the Trustees entertained delegates from the Oversea Legislatures of the Empire. The visitors were taken on a cruise and were accompanied by members of the Trust, representatives of the Corporation of Glasgow, the Chamber of Commerce, and the Executive Committee of the Empire Exhibition, Scotland, 1938. They proceeded through the harbour and docks and thereafter to the Firth of Clyde and Loch Long, returning to a city berth at the harbour at 4.30 p.m. In the evening the visitors attended a dinner given by the Corporation of Glasgow and on the following day they were entertained by the Chamber of Commerce and by the Exhibition Committee.

The Trinity House.

At a Special Court held on 24th May, at the Trinity House, Tower Hill, London, the Duke of Connaught was re-elected Master, and Captain A. R. H. Morrell, Deputy-Master of the Corporation of Trinity House for the ensuing year.

Preston Docks.

For the year ended March 31st last, the total imports and exports at Preston were 1,083,735 tons, a record figure which shows an increase of 83,477 tons compared with 1935.

The Question of Despatch in Discharge of Cargo

The following article is reproduced from the *Scandinavian Shipping Gazette* of May 5th last. It will be noticed that the subject is one affecting port authorities to whom appeal is made for their consideration of the matter.

There is a remarkable difference in some trades between the daily qualities stipulated in the charter party for loading and discharge and the actual despatch it is possible to obtain. In the current issue of the Baltic and International Maritime Conference monthly circular full particulars are given of a case in point where the charterparty provided for 350 tons superphosphate to be loaded per 24 hours, while the entire cargo of 1,910 metric tons was loaded in 13 hours. This case arose at Rotterdam. At Stockholm, which was the port of discharge, and where the daily quantity agreed was fixed at the same rate of 350 metric tons per 24 hours, the cargo was also discharged in less time than agreed, namely in about 3½ days.

Even with a comparatively high rate of freight owners will find that their calculations are thrown out, and that at the present time where they ought to be able to make both ends meet, the despatch money incurred takes away a serious part of the freight.

In its original and proper form payment of despatch money should remunerate shippers or receivers for speeding up the loading or discharge over and above the normal daily quantities. The provision is that they incur cost to extra work, and that the despatch money shall approximately cover this cost, as, if shippers or receivers render owners assistance in shipping or taking delivery of the cargo sooner than provided in the charterparty, they cannot be expected to do so at their own cost. This is a question to be specially agreed in each case according to the prevailing circumstances. What happened in this and what happens in many other similar cases is, however, quite a different matter.

Daily quantities are fixed in the charterparty which bear no reasonable relation to the actual despatch in the ports concerned. Neither shippers nor receivers incur any extra cost by loading and discharging at a quicker rate, as the quicker rate is the normal despatch.

The sole object of this procedure is to obtain a reduction in the freight rate, and moreover a reduction which owners are not able to calculate beforehand with any degree of certainty.

This procedure has another drawback. Owners cannot estimate the position of the vessel correctly. Even if they pay regard to the despatch the vessel is likely to obtain, they may be faced with claims for misrepresentation of the vessel's position for subsequent voyages if, for any reason, the vessel should not be able to load or discharge as quickly as they have reckoned with. It may be held against them, for instance in case of demurrage on trucks arising through delay of the vessel, that the previous position was calculated without regard to the quantities stipulated in the charterparty.

It stands to reason that it is first and foremost owners themselves who must refuse conditions of this kind, concludes the circular. Owners are not, however, the only parties to which this question should be of interest. There are also the Harbour Authorities. It seems high time that they paid some attention hereto.

When the ports are furnished with all modern facilities, this ought to be to the advantage both of merchants and of owners. It can hardly be the intention that by means of charterparty stipulations, charterers should secure for themselves all the advantage of good despatch, and make a profit for their own account out of the facilities provided by the Harbour Authorities.

Southampton Docks.

Southampton, during the weeks immediately preceding the Coronation, was one of the gateways through which many thousands of visitors entered this country to take part in the memorable celebrations, and the great liners that regularly use the docks were supplemented during this period by a number of others especially diverted to the port with contingents of Coronation visitors.

In addition to those from Empire countries, heavy complements of American passengers were dealt with at the docks, and throughout the early part of May exceptional activity was experienced culminating in the arrival of 6,000 visitors on one day alone—10th May. On this occasion ten liners arrived and 17 special boat trains were despatched to London within a space of 12 hours. Included in the day's total were 1,819 passengers disembarked from the Cunard White Star Liner "Queen Mary."

The Coronation Naval Review at Spithead on 20th May occasioned another exceptionally busy time at the docks. Besides a host of small craft, 15 large liners conveyed passengers to and from the Review, and during the 48 hours between 4 p.m. on May 19th and 4 p.m. on the 21st, more than 25,000 passengers embarked or disembarked at the docks.